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High-Precision Measuring Machines

By Joseph Kaye Wood

Consulting Engineer, New York City

Application of the manufacturer's primary standard bar—Details of design of the various types of precision measuring machines—Outlines of procedure—Advantages and limitations compared

THE author's previous article on Master Gages and the Higher Courts in Measuring, which appeared on page 873 Vol. 62, of the *American Machinist*, pointed out that the manufacturer's primary M.P. standard gage should not be used in such a way as to expose it to damage, wear or any severe strains. The M.P. standard is the last word and law within the manufacturer's system of dimensional control, being used only to check master gages and exceedingly accurate measurements in the work itself.

There are two general types of standards, the end-to-end type, in which length is defined as the distance between the extremities of a metal bar at a given temperature and the line-to-line type, in which the length is defined as the distance between two parallel lines ruled on the surface of a metal bar at a given temperature. In the latter type there may be inch or centimeter subdivisions of the standard length.

The structural details of the standard bar vary somewhat in accordance with the conditions under which it is to be used. In the case of an isolated standard, an H-section is usually employed because the distance between lines upon the surface of the horizontal web, which is coincident with the neutral plane during bending, will not be affected by sag in the bar due to its weight. Such a bar would be made of platinum-iridium or invar steel. The latter steel, however, which contains 36 per cent nickel is rather unstable, hence a steel having a greater nickel content is often used.

It is obvious, in checking master gages against the M.P. standard that some auxiliary means must be provided to subdivide the standard length. Thus we come to that very interesting phase of metrology which deals with length measuring machines and comparators. As the M.P. standard is built into machines of this kind, they are necessarily different from an isolated standard in structural detail and material.

There are two general methods for dividing the smallest division of the M.P. standard. One method requires a very sensitive screw micrometer while the other makes use of optical apparatus. Three important machines have been developed for making or comparing length measurements, the Pratt & Whitney end-measuring machine, the Société Genevoise universal length-measuring machine and the Brown & Sharpe end-measuring machine.

The Pratt & Whitney machine which is shown in Fig. 1, has a cast-iron bed designed to give the maximum rigidity and seasoned to assure stability and permanent accuracy. It is supported upon three feet to eliminate the possibility of distortion. The top of the bed is provided with V and plain ways for the sliding and stationary heads and sliding supports.

The standard bar, shown on the machine in Fig. 2, is rectangular in cross-section and is made of soft steel in which Swedish hardened-steel plugs are imbedded on about one inch centers. It is secured to the rear of the machine bed with the tops of the plugs level with the top of the ways. Fine microscopic lines are marked on the surface of the plugs by means of a diamond cutter in the Pratt & Whitney Company's laboratory. The inch divisions are thus transferred very accurately from a master bar, calibrated at 62 deg. F. by the Bureau of Standards at Washington.

When the standard bar is not in use, it is covered with a light coating of vaseline and protected by a metal cover attached to the machine. The pair of measuring spindles are set in the headstocks which rest upon the ways. One head is free to slide while the other is clamped tightly during the operation of the machine.

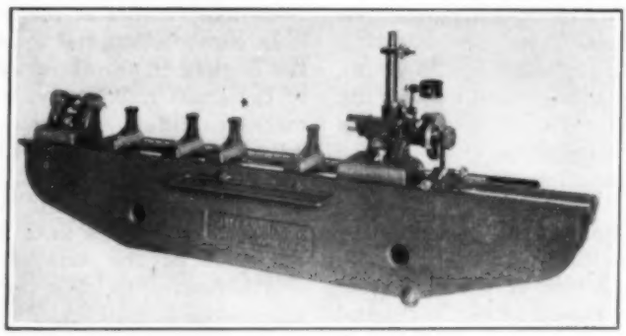

Fig. 1—Pratt & Whitney end-measuring machine

The sliding head, shown in Fig. 3, carries an accurate micrometer screw of 25 threads to the inch. An index wheel, with 400 equal divisions marked upon its periphery, is mounted on this screw thus making one of its divisions correspond to a movement of the measuring spindle of 0.0001 inch. The micrometer screw threads into a spring-nut contained in the end of the hardened and squared measuring spindle. Any slight wear in the screw is compensated for by a

special adjustment that either moves the spring-nut forward or backward, thus allowing for the loss or gain in the lead of the screw.

By means of the vernier and magnifying glass shown in Fig. 3 the 0.0001-in. division of the index wheel is subdivided into tenths or 0.00001 in. A tangent screw gives the final movement, and a linear scale records the number of turns of the index wheel.

The sliding head is set to even-inch divisions on the plugs in the standard bar by the microscope shown in

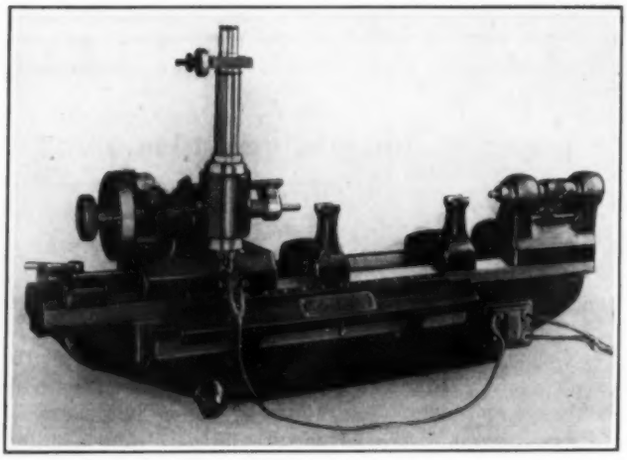

Fig. 2—Rear view of a smaller model

the illustration. In addition the microscope has a micrometer screw which can be used to check the accuracy of the main micrometer screw.

The stationary head, shown at the left in Fig. 4, carries the other measuring spindle which is also made of special hardened steel, and a device for determining the correct contact pressure of the measuring spindles on the specimen being measured.

The latter device consists of a small hardened and highly-polished steel plug (pressure indicating plug) held in position between two hardened and polished steel jaws by a slight pressure.

When a specimen is inserted between the spindles and the sliding head is moved slowly towards the stationary head, the pressure is relieved on the indicating plug and transferred to the ends of the specimen. Any small increment of excessive pressure beyond a certain point however, means compressing the spring through a small increment of deflection, which also means moving one of the jaws a slight distance away from the indicating plug. If the distance is only a fraction of 0.00001 in., the plug will drop to a vertical position without falling out from between the jaws, while if the distance moved is greater, the plug falls out entirely.

The procedure in making measurements on a machine of this type is as follows:

First the setting of the stationary head is checked by setting the index wheel and the linear scale on the sliding head to read zero; then the arm of the indicating plug in the stationary head is raised to the horizontal position by hand, and following this the sliding head is moved until the spindles in both heads are in contact and the plug arm just begins to deviate from its horizontal position. Under these conditions, the cross-hair in the microscope should coincide with the zero line on the standard bar, provided, of course, that the index wheel on the microscope itself is set to zero. If there is a wide divergence, the stationary head should be unclamped and set as correctly as possible and then reclamped.

For the final adjustment and for any small divergence, the microscope is sighted directly over the zero line and the contact pressure is regulated by turning the index wheel one way or the other. The index wheel is then made to read zero by moving the vernier scale, shown in Fig. 4, in the proper direction.

Inserting the Testpiece

The spindles are next spread far enough apart, by moving the sliding head along the ways, to enable the insertion of the specimen, and enough more to set the microscope approximately over the first line encountered on the standard bar. The slow-motion trailing head is then clamped and the exact setting of the microscope is obtained by means of the slow-motion screw, the sliding head itself then being clamped.

With this setting, the specimen will naturally not fit in between the measuring spindles, hence the sliding head spindle has to be advanced by turning the index wheel. Upon placing the specimen on the intermediate supports and between the spindles the index wheel is turned again, but in the opposite direction, until the indicating plug arm deviates from its horizontal position without falling out.

The index wheel is then read, giving a reading of say 265 while the vernier extends this to 265.4 and, since one index division equals 0.0001 in., the reading reduces to 0.02654 in. The linear scale is then read, giving say, 6.4 divisions or 0.64 in., and the standard scale is also read, which reading we shall assume to be 19.0 in. The total reading in this case without applying corrections is 19.66654 in. The corrections are those due to temperature changes and those supplied by the Bureau of Standards covering the calibration of the standard bar.

As the standard bar has the coefficient of expansion of tempered steel, the usual material in master gages, no correction due to uneven expansion is necessary, but to reduce an observed length to the length at 0 deg. C. the following multiplier is used:

$$[1 + \gamma \times 10^{-6} - \alpha t]$$

where γ is the coefficient of expansion of the standard bar and α is the coefficient of the specimen.

To reduce the length to that at at given temperature t_1 the following multiplier is used:

$$[1 + \gamma \times 10^{-6} \times t + \alpha (t_1 - t)]$$

In each case t is the temperature of the specimen or room temperature at the time of taking measurements.

In construction and appearance, the cast-iron bed of the Société Genevoise machine is quite similar to that of the Pratt & Whitney, but beyond this point the two machines differ. As shown in Fig. 5, the standard bar (M. P. standard) is not attached rigidly to the top of the bed, but is placed in a sliding head, or carriage, which travels along the ways in such a manner that the scale is always in a line coincident with the prolongation of the axis of the piece being measured. Furthermore, in this arrangement, the micrometer microscope is maintained stationary. Likewise the headstock which contains the micrometer screw, index wheel and indicating divice for the contact pressure, is kept stationary, being screwed down to the top of the ways on the right-hand end of the bed.

The machine is made in three sizes, the smallest having a capacity for measuring specimens 40 in. in length. The description to follow will pertain to this latter size.

Although 40-in. specimens can be measured on this

machine, the length of the standard bar is only half of this or 20 in., the reason for which will be explained later. The section of the bar is rectangular, measuring about 0.84x0.40 in. It is made from a 58 per cent nickel steel, which is non-corrosive and has a coefficient of expansion about equal to that of ordinary carbon steel.

The bar is graduated to read from left to right starting at 0 and ending at 20 inches, the smaller divisions being equal to 0.05 in. At a distance of approximately 1.5 in. beyond the 20-in. mark, graduations 0.005 in. apart are provided for checking the 0.005-in. divisions in the glass scale of the microscope. The lines which are about 0.0002 inches in width are carefully made on a highly polished surface. A protective metal case with sectioned covers protects the standard bar from accidental blows.

The sliding head, besides containing the standard bar, carries one of the measuring spindles. It may be moved to the right by loosening the clamp in the head until both spindles are in contact. Providing the index wheel and pressure-indicating device in the stationary head are set to zero, the left-hand end or zero graduation of the standard bar will be concident with the cross hair of the right-hand microscope, assuming, of course, that the micrometer in the latter is set to zero.

Determining the Length of the Specimen

Putting any specimen which is less than 20 in. in length between the measuring spindles necessitates sliding the standard bar to the right, the point moved to being read on the standard bar through the right-hand microscope. This reading is the length of the specimen. If the specimen is just equal to 20 inches, a reading of 20 inches is obtained through the right-hand microscope while the left-hand microscope shows a zero reading on the standard bar. Again, if the specimen is greater than 20 inches, the right-hand microscope is off the scale, and the left-hand microscope gives readings for the added length of the specimen above 20 in.

Thus with the two stationary microscopes spaced exactly 20 in. apart by the makers, and with a sliding 20-in. standard bar the lengths of specimens up to a maximum of 40 inches may be read very much in the manner of ordinary chaining. The magnification is 80 to 1 which enables readings to be made to 0.00005 in. The long, exposed scale on the top of the bed at the front, which is 40 in. in length, is merely for rough guidance and checking. The sliding head can be moved along the bed quickly by hand when a large traverse is desired, after releasing its clamping lever, or it can be moved very slowly, after locking the lever, by turning the small handwheel.

The stationary head, or micrometer headstock as the makers call it, consists of an accurate screw fitted with a graduated index wheel and vernier reading to 0.00001 in. Rotation of the micrometer screw gives movement to the plunger in which the other measuring spindle slides, the position of which is controlled by a spring. The spindle serves to indicate the contact and the amount of pressure exerted on the specimen being measured. An index pointer, moving over the small graduated scale of the pressure-indicating device follows the movements of the spindle with relation to the measuring face to a magnification of 1000.

The graduated scale is inclosed in a metal case with a glass cover. It is graduated in 0.05 in. so it is possible with the naked eye to estimate measurements to 0.000005 in. The spring which operates the spindle with the measuring face has a double action. It acts under compression in external, and under tension in internal measurements. The action of the spring is reversed by turning a ring nut three-quarters of a turn between two positions marked "EXT," and "INT." This contact-pressure indicator also serves as a rapid comparator if it is used without moving either the standard bar or headstock micrometer.

There are two general methods which can be used for measuring a specimen on this machine, the optical and the mechanical. In the former, the index wheel of the headstock micrometer and the contact-pressure indicator are made to read zero, while the readings determining the length of the specimen are taken from the standard bar, the glass scale and the index wheel of the micrometer microscope. In the mechanical method, the microscope is used only to control the movements of the standard bar to the even 0.05-in. division, while the headstock micrometer is used to measure the smaller fraction. In each case, previous to placing the specimen on the intermediate supports between the measuring spindles, the total zero setting must be made. By total zero setting is meant the setting of all index wheels, microscopes and indicators to read zero.

The detailed procedure for the two methods is as follows:

Optical method

1.—Set the head-stock index wheel to read zero.

2.—Bring the traveling head toward the stationary head. Put a piece of clean soft paper between the measuring spindles and then draw the paper out, leaving the spindle surfaces clean.

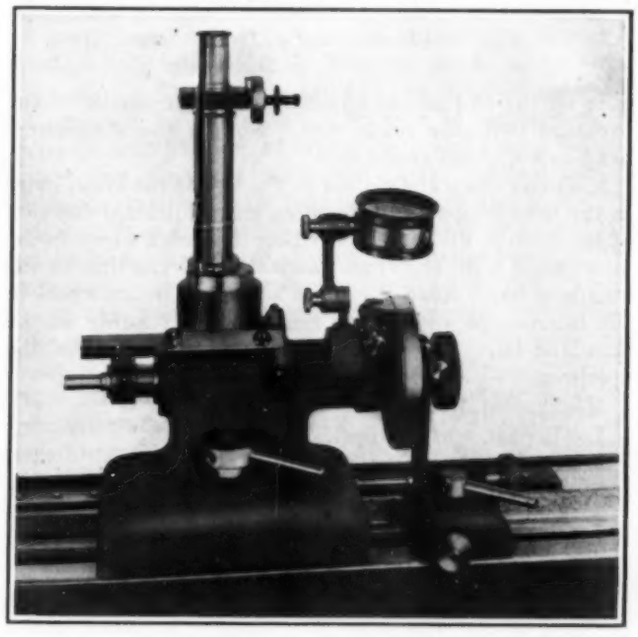

Fig. 3—Detail view of the sliding headstock

3.—Set the sliding-head pointer to read zero on the rough scale and, by means of the slow motion control, bring the needle of the pressure indicator to read zero.

4.—Set the index wheel of the right-hand microscope to read zero.

5.—If the zero division of the standard bar does not appear midway between the cross-hairs of the right-hand microscope then move the glass scale by means of the key, or move the vernier of the stationary index wheel until it does.

6.—Move the sliding head toward the left and insert the specimen between the measuring spindles on the intermediate supports. Adjust the elevation and alignment of the specimen with respect to the axis of the measuring spindles.

7.—Bring the measuring spindle of the sliding head to

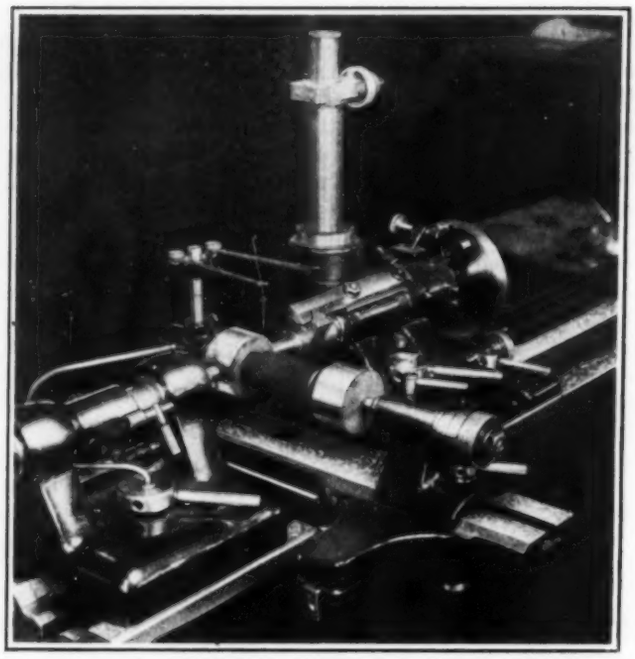

Fig. 4—Measuring a thread gage

bear on the end of the specimen until the needle of the pressure indicator reads zero. Note if the stationary-head index wheel reads zero.

8.—Read the standard bar to the left of the cross hairs in the microscope and determine any additional fraction of the 0.05-in. division by turning the index wheel in the microscope until the cross hairs straddle the line on the standard bar. Read the glass scale and index wheel in the microscope and add to the previous reading of the standard bar. This reading will be the length of the specimen.

Mechanical Method

1.—Repeat 1 of the optical method.

2.—Adjust the microscope to its zero setting.

3.—Repeat 2, optical.

4—Repeat 3, optical.

5.—Repeat 5, optical.

6.—Repeat 6, optical.

7.—Bring the stationary headstock spindle away from the end of the specimen by turning the index wheel. Then with the slow-motion screw bring the sliding headstock towards the stationary head until the next division line on the standard bar appears midway between the double cross-hairs in the microscope.

8.—Bring the stationary headstock spindle towards the end of the specimen by turning the index wheel, until the pressure-indicator needle reads zero. To the number of whole divisions (0.05 in.), read on the standard bar through the microscope, add the following readings, on the stationary headstock: The linear scale, the index wheel and the vernier on the index wheel. The total reading, thus obtained, may then be rechecked by the same, or by the optical method.

Since the standard bar is of 58 per cent nickel steel, the coefficient of expansion is equal to 0.0000115 in. per deg. centigrade, and to correct an observed length, the formulas given for the Pratt and Whitney machines are used.

Furthermore, since the standard bar is accurate only to about 0.0002 in., a table of errors is supplied with the machine by which each division of the bar may be corrected. By interpolation, corrections can be made for intermediate points to within 0.00002 in. The table is determined by a comparison between the standard bar on the machine and a master standard in the laboratory of the Société in Switzerland, which in turn has been compared with the International standard in Paris. The same precautions that are necessary for the Pratt and Whitney are also necessary for this machine.

Level Surface Replaces Vees

The bed of the Brown & Sharpe machine, which is shown in Fig. 6, is somewhat different in appearance from either of the others. It consists of a cast-iron box section, 16 in. in depth, with 1-in. side walls giving the effect of two I-beams placed side by side. The top surface of the bed does not have the combination of V and level ways, but consists of one level surface, accurately planed and scraped.

Two headstocks are arranged to slide on the top surface. They may be clamped in any desired position by the levers shown. The right-hand or micrometer headstock carries a 40-pitch micrometer screw and a corresponding index wheel having 250 graduations upon its rim. A vernier and magnifying glass, to aid in reading, are provided with the index wheel. Unlike the other two, this machines does not have a contact-pressure indicator.

The left-hand head contains a beam for supporting the standard bar which can be traversed with respect to the head itself by means of the handwheel shown at the extreme left. For slow motion, the beam is clamped with the adjacent lever. The other handwheel in the plane of the cut is used for traversing.

One measuring spindle is integral with the extreme right end of the supporting beam, while the other is, of course, the end of the micrometer screw in the micrometer headstock. The microscope is arranged so it may be traversed directly over the standard bar. Adequate illumination is provided for the microscope

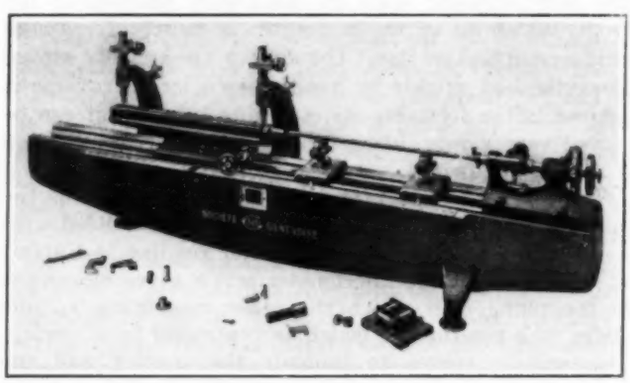

Fig. 5—Société Genevoise universal length-measuring machine

and is arranged so it may be in use only during a reading.

The standard bar is similar in construction to the Pratt and Whitney bar except that the inserts are stellite instead of Swedish steel. The inserts are placed 1 in. apart, the overall length being 7 in. The inch

divisions are carefully set by ruling a line 0.00004 in. in width on each insert with a carefully prepared diamond point. Since it was desired to design a bar whose divisions were so accurate that the errors could not be detected by microscope, or by micrometer screw, the spacing of the lines was accomplished by means of a Michelson type of interferometer.

The end insert at the right has 40 lines, spaced 0.025

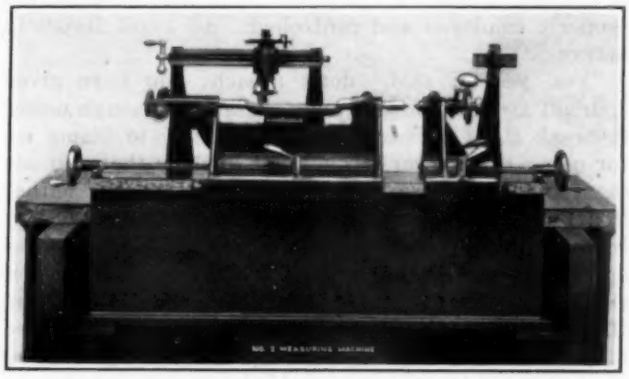

Fig. 6—Brown & Sharpe end-measuring machine

in. apart. Thus the elimination of dependence upon a screw for the accuracy of a measurement is practically accomplished because it is necessary to use but half a revolution of the screw as a maximum. This half turn gives linear values which are accurate within 0.00001 inch.

The standard bar is placed on the supporting beam so the top surfaces of the inserts are coincident with the axis of the pair of measuring spindles.

The 80-1 microscope is mounted to traverse along a beam by means of the screw shown, the surfaces of which are scraped and aligned with the axis of the measuring spindles.

Since the micrometer screw has 40 threads to the inch and the index wheel 250 graduations, a single division on the latter indicates a change in position of the measuring spindle of 0.0001 in. along the axis of the machine. The fifth decimal place is indicated by a vernier plate mounted to overlap the edge of the wheel.

Procedure in the use of this machine is similar to that for the Société Genevoise machine except that a little more flexibility is provided due to the sliding support for the standard bar. Considerably more skill is required however as no contact pressure indicator is provided. This is offset by the fact that the standard is more exact, no table of errors being required, and the chance of error in using the micrometer is greatly reduced. The same general precautions specified for the previous two machines apply nevertheless.

Each of the machines described has certain advantages and limitations. In the case of the standard bar, the Brown and Sharpe design, although not so long as the others, is more carefully and accurately made. The Société Genevoise takes the stand that if the error of the graduations is known, the bar need not be made so carefully.

Both the Société Genevoise and Brown & Sharpe machines have the top surface of the standard bar coincident with the axis of the measuring spindles, which lends to greater accuracy.

The former has the microscope fixed and the standard bar movable which introduces a cosine error while the Pratt & Whitney machine has the standard bar fixed and the microscope movable which introduces a tangent error. It can be shown that the tangent error is more serious than the cosine error. In the Brown & Sharpe machine both the standard bar and microscope are movable, introducing a combined error which may, in the worst case, be serious.

The micrometer screw of the Pratt & Whitney machine has 25 threads to the inch, as compared to the 50 threads on the Swiss machine and the 40 threads on the Brown & Sharpe. It is generally felt that 25 threads to the inch gives a screw which is the easiest to lap and polish for unit length. A screw with 50 threads is probably too fine for high accuracy and it is good practice to furnish a table of errors in this case. Although the Société Genevoise and likewise the Pratt & Whitney machines have compensators which are supposed to automatically correct the errors in the screw, it is doubtful whether these devices are actually effective. The Brown and Sharpe machine uses a fine thread but eliminates all chance of large error by using only one-half the revolution of the screw in making measurements. This is made possible by the fact that the end division on the standard bar is subdivided into 40 graduations.

Comparison of End-Pressure Control

The method of controlling the pressure of contact on the ends of the specimen being measured is essentially different between the Pratt & Whitney and the Société Genevoise machines, while none is used in the Brown & Sharpe design. In both, the pressure is obtained from a helical spring. The amount which the spring is deflected in the Pratt & Whitney machine, to obtain the same pressure of contact for each measurement, is determined by the small differences in pressure necessary to drop the arm of a very light and highly polished steel plug from the horizontal to the vertical position between two jaws having spindles of highly polished steel. Since all surfaces are so highly polished, it is evident that a very small and unknown amount of friction is the controlling factor in this indicator.

In the Société Genevoise machine, the deflection of the spring is measured definitely by a compound-lever system, magnifying the deflection 1000 to 1. Although this indicator gives a more definite control it is more complicated than the Pratt & Whitney indicator. In a certain case which the writer knows about the indicator-plug device of a Pratt & Whitney Machine was replaced with a delicate liquid-gaging device which originated in Germany.

This device consists of a diaphragm inside a drum of relatively large diameter, one side of which is filled with a liquid. Movement of the measuring spindle on the stationary head moves the diaphragm and is transmitted to the liquid which rises inside the small-diameter tube attached to the drum. The ratio of the diameter of the drum to that of the tube is 1300 to 1, the sensitivity being such that a movement of 0.00001 in. of the measuring spindle corresponds to a movement of $\frac{1}{4}$ in. of the liquid. This device besides being definite in its control is very simple. Temperature changes and leaks, however, have to be carefully guarded against.

The above comparisons show that each machine has certain advantages over the others, it must be remembered, however, that quality of workmanship enters largely into the question of accuracy and reliability and makes an ultimate over-all comparison largely a matter of personal opinion.

Once More—What Is a 50-Ton Press?

By A. Kwizzer

I HAD some real trouble a few weeks ago; broke the crankshaft on one press and the frame of another. Breaking things in a press room is nothing new and I am quite used to it, but these particular breakages came at a particularly bad time. I simply could not afford either of them just then and I felt pretty sore at the maker of the press, at the man who set the dies, and most of all at myself for not knowing why the blooming things broke. New presses, too—not six months old.

I was so sore I forgot my prejudices and called up the pressmaker on the long distance. I don't like to do it because, as a rule, a long distance call, coming or going, is not a sedative for a troubled mind and I confess that after I had wrestled for two hours with deaf telephone girls, lines that were in use, wrong numbers and "wait a minute," I was ready to commit murder. When I got my man I bellowed:

"Do you know that I broke two of your . . . presses?"

I was cut off, which cooled me down somewhat, and when an hour later Mr. P.M. called me up I was ready to talk English. We arranged for him to come and have a talk on the subject.

When we had lit up (and I want to say in justice to him that he sports a very good brand of cigars) he said:

"I understand you had a little trouble with our presses."

"Little," I said, "is not the correct word, and furthermore they are my presses and not yours. I paid for them—very foolishly."

I showed him the job which broke the frame; a little swaging job. He looked at it, turned it over, looked again and then said:

"You did this job on that press?" (With the accent on *this* and *that*.)

"Tried to do it and failed, or rather the press failed. I wonder if that press could have cracked a walnut without failing."

You see I was still sore and tried to make the other fellow sore, too.

"Well, now," he said, "as a matter of fact you should not have done this job on that press. It is too much and you couldn't expect anything but trouble and that is what you got. I am sorry, but any piece of machinery has its limits and when you go beyond them you may expect trouble. Why didn't you put this up to us and let us advise you?"

"Well, the idea of submitting every job to you would be preposterous and entirely impractical. Why don't you fellows give us some general rules so we can judge for ourselves?"

"Well," he said, "that is not so easily done. Now in your case, your blank is thick and you put pressure on the frame of the press for quite a good part of the stroke, and under those conditions the frame is liable to break."

"I should say it is," I interjected. "In fact it did. Now I want to remind you of the talk we had when you sold me this press; and after my little speech I expect you to say that you'll make good."

"We certainly will if we are to blame."

"If," I snorted. "Why, man, when I bought this press I selected one with direct drive. You urged me to change my mind and take the same model, but geared, and told me how I would get ever so much more power."

"Power," he said, "yes, ever so much more. Why enough to break the frame . . . err . . . that is, I mean, it has enough power to cause damage if not properly employed and controlled. All great forces in nature . . . ."

"Yes, yes," I said, "don't preach; you have given yourself away. You sold me a press with enough power to break itself in two and then you try to blame me for using that power. How is it anyhow that you use the same frame for direct and geared drive. Either it is too much for the one or not enough for the other. In the first case I pay too much when I buy the press and in the second case I pay too much when I have it and it blows up. And now, the other press. What kind of an alibi are you going to produce here? All we used it for was a job of plain forming; nothing big, nothing hard, why a strong man could do it with his hands. You just tell me how we are to blame for a broken crankshaft."

"That's easy," he said. "The punch was set too far down and struck the metal hard. Of course, the flywheel had to dissipate its accumulated energy some way. The slide being stopped suddenly, this energy was spent in snapping the crankshaft."

"Your language is beautiful," I said, "I certainly agree with you that your presses are dissipating, my energy as well as their own. But why didn't the belt come off or the safety pin break or something less expensive than a frame or a crankshaft?"

And so on and so on till far into the afternoon.

I have not heard yet what his company is going to do about it. But meanwhile how is a well meaning but ignorant pressman to know how and what and when and why?

Information earnestly requested.

Large Die-Casting Machine in California

What is probably one of the largest die-casting machines in existence has been built by, and is now in operation at the plant of, the California Die-Casting and Manufacturing Co., at 3040 South Main St., Los Angeles, Calif. The machine itself weighs over 6 tons, while the pot carrying the metal has a capacity of 2,200 lb. The goose-neck alone holds 85 lb. of metal.

The castings vary from one pennyweight to 45 lb. each, the die space being about 30 in. square. Castings are made at the rate of from 1¾ to 9 operations per min. If two or more castings can be made at once, the capacity is correspondingly increased.

The machine is automatically operated, even to the heat regulation of both metal and dies. A 5-hp. electric motor drives the machine through a four-speed gear box for speed regulation. The dies are opened and closed by a Geneva movement. The moving die plate closes under a pressure of 75 tons. A layer of special firebrick insulates the melting pot so effectually that after heating, the fire may be shut off and the temperature drop will be but 6 deg. in a 2-hr. run. The operation of each function is timed and controlled through a single drive, the flywheel running continuously after the switch is closed.

Automotive Production

More About Sheet Steel in the Automotive Industry

By John Younger
Associate Editor, *American Machinist*

Stampings 35 per cent cheaper than castings—Usually much lighter in weight — Big production possible — Built-up complex structure from stampings — Use of spot welding

THE Maxwell-Chrysler Corporation uses pressed steel parts extensively, and there is a growing tendency to a still greater use. Malleable iron parts in particular, and drop forged parts to a certain extent, are being carefully studied to determine if they can be supplanted by stamped or pressed material. It is stated that about 60 per cent of the present-day automobile is composed of sheet steel in one form or another. Naturally the pressed materials in the body enter largely into this figure.

At a recent meeting of the Society of Automotive Engineers, F. R. Pleasonton, in speaking of sheet metals, stated that there was still a tremendous future for the use of pressed steel. He believes that we are only on the fringe of the proper technological study of the subject, and that what has been done has been accomplished mostly by rule of thumb and direct experience methods.

This statement is somewhat broad. Fred Aldis, who manages the pressed steel work of the Maxwell-Chrysler Corporation states that at present each piece is an individual study in itself, and that great attention must be given to all the factors entering into the processing. The material is all-important, and it is in this respect that there is an absence of fundamental data on which to base specifications. One maker believes in the Olsen ductility test as a measure of the pressing characteristics. Another believes in Ericsson tests checked by Rockwell hardness readings for the same purpose, and finally there is a group that is thinking in terms of a check-up on the micro-structure.

Coupled with these factors is the vital one of finish. Shall the surface be glossy or matte? Shall it be dead-smooth or merely "mill-smooth"? These questions

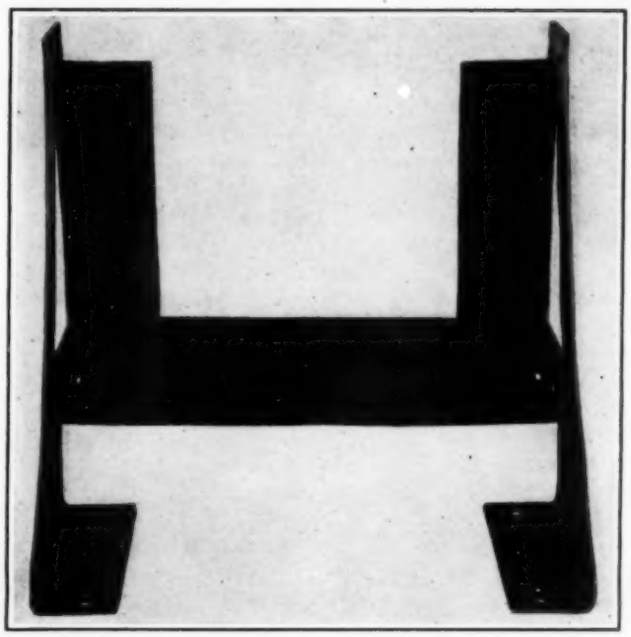

Fig. 1—Built-up battery-box support

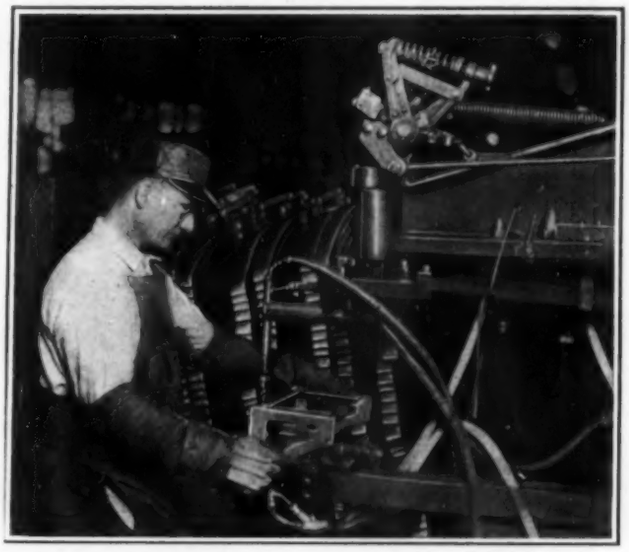

Fig. 2—Spot welding the battery support

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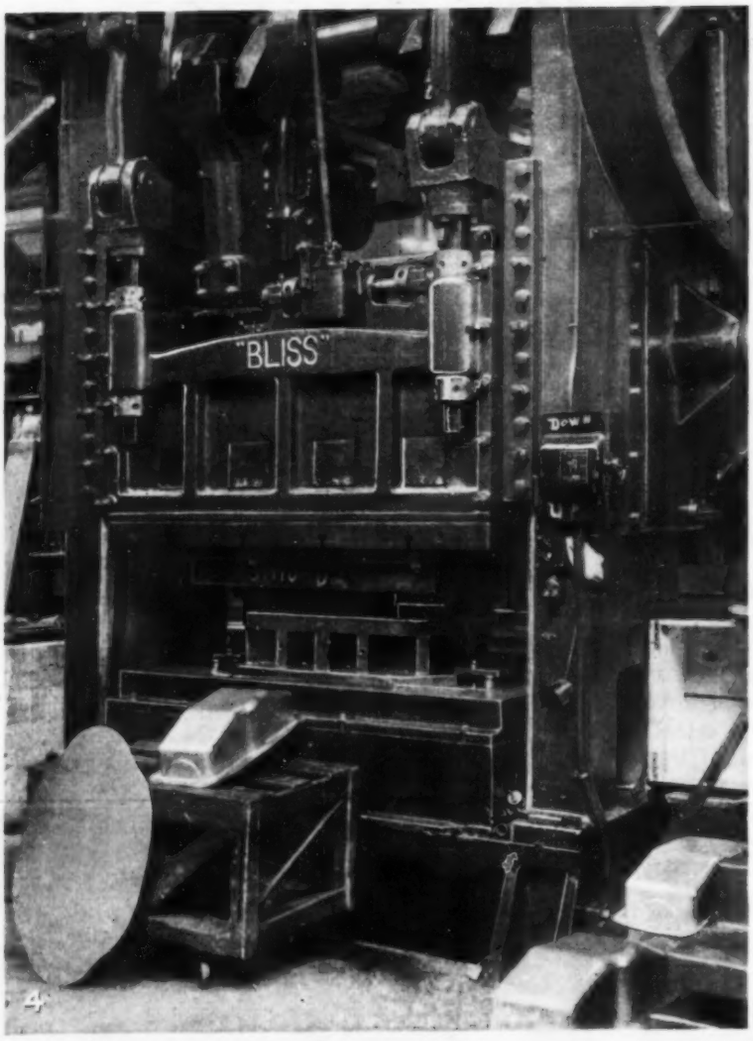


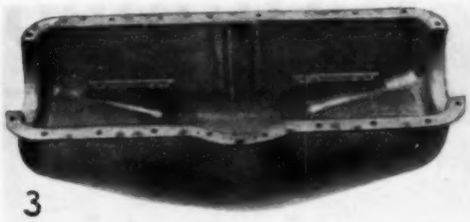
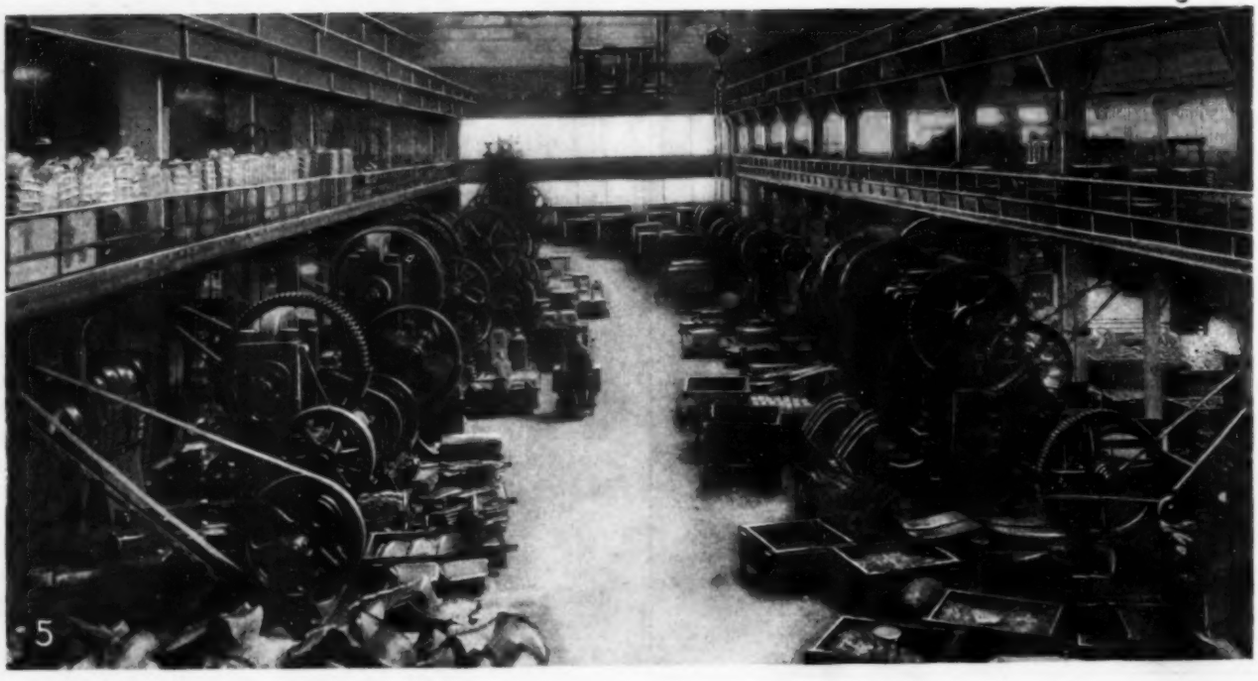


Fig. 3—An oil pan

Fig. 4—Stamping oil pans

Fig. 5—General view of Maxwell-Chrysler press department

Fig. 6—Oil filler and half section



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are most important as the after finish, lacquer, enamel or varnish, is a determining factor as to whether the vehicle is pleasing or not to the eye.

There can be little standardization on the size of sheets where multiple production is expected. The size of the scrap pile is the governing factor and sheets must be of such width and length that a minimum of scrap is left when the pieces are stamped out. There is, of course, a value to the baled scrap but it is very small compared to the original cost of the material.

Now as to the question of what makes pressed steel more desirable than a casting or forging, there are many answers. Possibly, the first consideration an automotive engineer would think of would be the saving in weight, strength for strength. Pressed material can be had as thin as 24 gage or even 28 gage and there is no diminution in the proportionate strength where such thin material is used. Parts that have practically no stress to bear can very well be made up of pressed metal at a considerable saving in weight over a casting or forging, which have to have considerable thickness to insure unbreakable characteristics.

The next consideration, felt more strongly by the

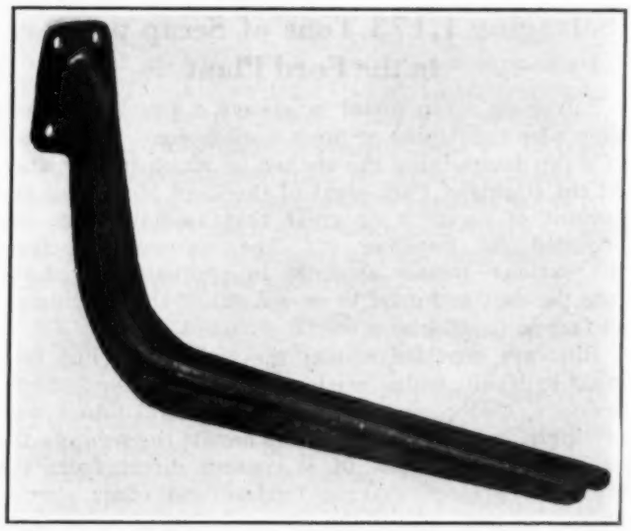

Fig. 7—Running board hanger

purchasing agent or cost man, is that a considerable saving in expense can be effected by the use of pressed steel parts. Mr. Aldis roughly estimates the saving at 35 per cent, stating that this would be a conservative estimate in many cases.

Lastly, the production engineer would think of the bigger possibilities of production with simple equipment, as well as of the short interval of time between the availability of the dies and the production of the part.

These three viewpoints are powerful factors and are causing a decided trend towards more and more complex pressed metal parts. Formerly a stamping was an individual unit of simple design, not far removed from the product of the coin stamping machines of ancient vogue. Today stampings have become larger and more varied in shape and size, and in addition complete structures are being built up from simple stampings by means of spot welding or riveting or seam welding.

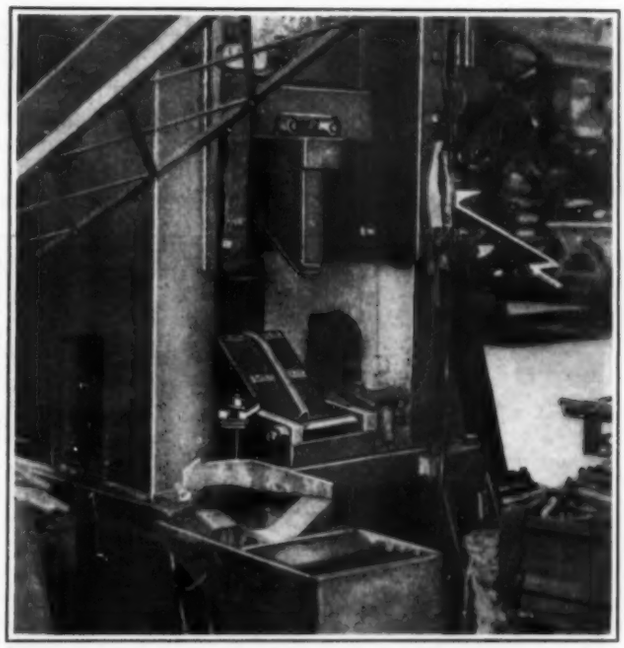

Fig. 8—U-ing and forming running-board hanger

The most striking example is shown in the large production of all-metal welded bodies. One example of this type of structure is shown in Fig. 1, a photograph of a battery support. This structure is built up as shown in Fig. 2 by spot welding, each of the various parts being a separate stamping. Another example is shown in Fig. 3, an engine oil pan made from terne plate blanked and stamped as shown in Fig. 4. In this case attachments are made by soldering and also by riveting.

It would be of little value to give a tabulation of the various pressed metal parts used in an automobile, but Fig. 5, illustrating only the large presses used in the Maxwell-Chrysler plant, will give an idea of the capacities involved. Oil pans, gasoline tanks, fenders, radiators, brake parts, spring brackets, dash parts and so on, are largely built up in this department.

The part shown in Fig. 6 is another complex struc-

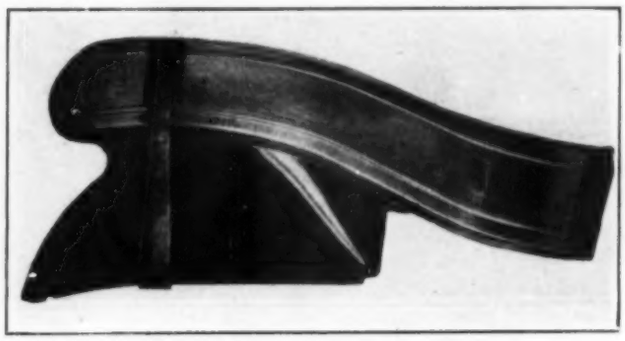

Fig. 9—Front fender and support

ture built up from pressed steel parts. Five separate individual stampings make up the one filler. Terne plate is the material used and the two halves, one right and one left, are soldered or sweated together in a suitable jig. The flange is also sweated on.

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The running board hanger, Fig. 7, is a good example of a pressing replacing a forging and in the manufacture of this, Fig. 8, an ingenious idea is used to prevent the metal being drawn at the "U-ing" part. The lower block of the die is not fixed rigidly on the base but has a slight to-and-fro motion controlled by springs. This block can therefore accommodate itself to slight variations in the metal and can place itself truly under the descending upper part of the die.

Fig. 10—Marking off fenders in jig

Fenders are becoming more complex but their manufacture is becoming simplified. The front fender is shown in Fig. 9. Notice that it also is a built-up structure with its side apron and support. The rear fender is shown in Fig. 10. This fender is fastened to the body and the illustration shows the fender resting in a simple wooden fixture whose upper part has spikes corresponding to the screw holes. When the upper part is brought down the spikes practically center punch the fender and in addition the side of the fixture is used for a scribing template to mark off the parts of the fender to be removed according to the type of body it is fitted to. All rear fenders are initially pressed the same but are marked off differently in this jig. The parts not required are removed by rotary or disk shears.

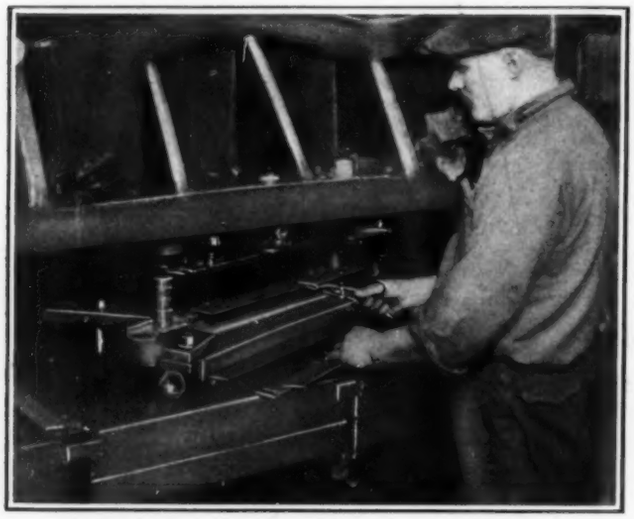


Fig. 11—Handling pieces with tongs

Some of the points noticed in the press department showed the thought now given to this work. The inside of the press columns is painted white as shown in Fig. 8, and once a week this is cleaned and kept up to a standard. The paint reflects the light and makes the dies more clearly seen, contributing to freedom from accidents.

Tongs are used extensively as shown in Fig. 11 to keep the operator's fingers well out of the way. The jaws are shallow and flat so that if the dies do strike them little damage is done.

The storage and scrapping of dies are serious problems. Dies are held for five years after the part has been declared obsolete or after it is replaced by another. During this period the demand for the part for replacement purposes is closely analyzed and at the end of the five years a sufficient quantity is made up to insure future service demands being met. When this requirement has been complied with, and only then, the dies are scrapped.

Salvaging 1,173 Tons of Scrap per Day in the Ford Plant

Salvaging scrap metal is always a problem in any shop where stamping or press work is done, the amount of scrap determining the method by which it is treated. At the Highland Park plant of the Ford Motor Co., the amount of scrap is so great that special means are provided for handling it. The accumulation from the various presses amounts to approximately 1,173 tons per day, and must be moved out of the way almost as fast as it collects.

Bins are provided and at the end of the line is a great hydraulic baling machine, working under 2,500 lb. pressure, that compresses the scrap metal into a surprisingly small bale. Conveyors handle the scrap to the baling machine, some of it coming direct from the trimming presses, making fenders and other similar parts. In some places the accumulation of scrap is so great and so persistent that machines had to be rearranged and a conveyor and baling machine installed to handle it.

There are places where the machines are so arranged that the scrap from one press can be utilized by others in the line. When the large scrap pieces reach the right machine, they are taken off the conveyor, the smaller pieces cut out and the remaining scrap replaced to go on its way to the baling press.

The Ford industries are doing a good work in calling attention to the elimination of waste and many points are to be obtained that can be utilized in all sorts of plants.

By careful planning it is possible for them to reduce the percentage of waste to a very small figure so that the amount of salvage means an even larger total weight of metal handled than might be supposed. With such a large variety of pieces as is used in motor car work, it is easier to utilize more of the waste than would otherwise be possible, this being one of the advantages of corporations having large output and a number of different parts that add to flexibility.

Engineering Education in Industry

By F. C. French
Marquette University

Where is executive material to come from?—The objections to the post-graduate apprentice courses—How the co-operative plan avoids the trouble

RECENT conferences with industrial executives, who are insistent that there is a shortage of executive material in their particular field, brings back the question of what is being done in the engineering schools to supply this material. This question is not new; it has often been discussed by engineering educators and changes in curricula have been made from time to time, which reflect the majority opinion of what is necessary and desirable in a fundamental engineering education.

It is not denied that many things are omitted that would be of material benefit to an engineering student leaving college, but the ever recurring question is: "What shall be left out of the present curricula to make room for this subject?" The majority opinion has not been able to answer. The general trend of opinion seems to be that the present needs are to train men for engineering positions, and that the operating and allied positions will come to those desiring to qualify for them by a systematic experience in industry. This of course is true to an extent, and yet does this offer the ideal solution of the problem?

What the Employer Expects of a Graduate

Engineering college instruction is very largely of a highly technical nature, and the outstanding idea is to teach the student how to do the thing with which he is at the time concerned. In the present stage of industrial development this does not satisfy the desires of the employer. He is more particularly concerned with the question: "Why is this thing done in this manner?"

He knows how it is done. He also knows that it is possible of accomplishment in either of several ways. What he wants and wants badly is for the student to see why this thing can be done in a certain way to the exclusion of the other methods, and he is insisting that the student be given such training in the colleges as will make this question have a logical and easy answer.

How is this to be done along with our present curricula and if at a sacrifice of something we now have and can point to the value of, where shall the sacrifice be made? The answer is not clear.

The engineering sales end of industry also has its problems and the colleges have repeated demands for men having desirable qualifications not covered in our present methods of teaching. Can they be supplied?

The salesman must certainly be fully conversant with the technical details of his product, but can that not be carried to the extreme? Are our salesmen not too often traveling technicians instead of true salesmen? Do they stop to make a true analysis of their product in the face of mechanical and technical details as good selling argument? How many salesmen are equipped to sit down with a possible purchaser, analize his problem and prove to him that the product offered is the economic solution to that problem?

Here the economics of industry again confront us, and we ask ourselves if we are training engineering students to meet the demands placed upon them.

Educators contend that preparation such as indicated and desired by industry, tends to specialization along certain lines, and that the engineering student, from his lack of knowledge as to his future employment, should not be a specialist but should be qualified to accept any engineering position offered, in line with his chosen field, and be qualified to make reasonable progress in that field.

To get the particular qualifications desired, industry has organized, and is organizing, courses of instruction and training in particular plants, or groups of plants, open to graduates of engineering schools and varying in length from one to two years. In these courses the graduate student is put through a regular course of instruction, progressively through the different departments of the industry, with the purpose of familiarizing him with the machines and processes made use of in the different phases of production and to give him a general idea of the interdependence of departments and their relation to the product produced.

These courses are successful in varying degrees and dependent to a large extent upon the wisdom displayed in picking the graduates to be given such courses. Industry complains of a lack of vision on the part of graduates from whom such selection must be made, and insists that the remedy lies in the engineering colleges.

Dangers of Fancied Superiority

It further complains that the idea of a man with a college education coming into a plant to learn machine operations, is detrimental to rapid progress in such learning; that the college graduate brings with him an air of superiority to his surroundings and associates and a feeling of tolerance for that which he must do rather than a desire to get everything possible from this operation within the allotted time. This feeling is imparted to mechanics and foreman, and their reactions are not such as make for rapid progress of the graduate student. He is watched and his efforts are commented on unfavorably by the shop men. His mistakes are magnified and broadcast in the little world of the shop and become of universal knowledge.

His attitude of superiority makes it more or less of a pleasure for the shop man and mechanic to withhold from him the little tricks of the trade which make for

ease and rapidity of production, and to comment unfavorably when lack of these trade secrets makes his ability show poorly in contrast. He resents this and his resentment makes his acquirement of valuable experience and constructive criticism more difficult. The more or less strained relations between men and students is noted by executives and the question is raised as to whether a wise selection has been made in picking this particular man for the course, and whether the proper method to get the maximum results desired with a minimum expenditure of effort has been devised.

Here in the Milwaukee field, in which are developed very large manufacturing interests and consequent peculiar advantages for such an arrangement, a combination course has been developed by careful study on the part of both industry and educators to meet the above objections. The course is offered by Marquette University College of Engineering, and it is made possible of carrying out by the whole-hearted co-operation of the big manufacturing companies in the vicinity.

This course is of the co-operative nature and its essential features are these. After the first year's work at the university, which will be increased to two years beginning next year, because of the fact that the natural high percentage of loss in the first two years should be borne by the university instead of industry, the students of the university are divided into two equal groups or sections, and one section is sent into the shops while the other section is given instruction in the university.

Each co-operating firm has a given number of pairs of students, having as nearly the same characteristics as possible, and one of each pair works in the shops while his alternate is receiving instruction in the university. At the end of each four-week period, the pairs change places and the man from the shop comes to the university for his instruction, which is identical with that which his alternate received.

How the Student Advances in the Shop

The work in the shops is co-ordinated and arranged on a schedule so that there is a regular advancement through the departments of the manufacturing plants to the end that on the date of graduation the student has had experience in all departments of that plant. If he has shown the required adaptability, he is qualified for a position equivalent to an assistant foreman in that shop.

The student enters the plant and shops as a "cub," instead of as a college graduate. He readily makes friends of the shop men and learns from them their trade tricks and methods. We find that shop men have no inherent desire to belittle their efforts. In fact most of them take a delight in imparting knowledge to these students because they expect later to point with pride to their advancement.

Their supervision throughout their shop employment is in charge of a man familiar with and schooled in apprentice training, and it is to the particular interest of this supervisor, as well as the higher executives, to make as much from this student as possible for all recognize the fact that it is from this material that future executives will be made.

This course, of necessity, runs for twelve months in the year, and on the basis of the standard engineering college curriculum can give only six months of that work in a single year for the reason that six months of the year are spent in the shop in practical engineering experience.

To complete the requirements of the regular engineering schools, five years of co-operative work are now required, and this gives the student on graduation a four year college course in engineering, plus two years of practical experience, spread over four years of contact with his particular shop.

The course offers two distinct features. It picks out the man unfitted for a position in industry before he has acquired a scholastic education in that field, and it gives, on graduation, two full years of training in the particular industry chosen and a permanent position in that industry in case the student has developed the characteristics required for an executive position.

A considerable study is at present being given to the end of offering an additional year of co-operative work, devoted almost exclusively to the economics of industry, labor problems and social relationship, business principles and management, accounting, finance, valuation and taxation.

The Means of Happiness

By Arnold Richmond

There is a general complaint among manufacturers of dry goods and clothing that business is bad; that people seem to be prosperous but unwilling to buy and many wonder why that should be. All kinds of explanations are offered, such as short skirts and a cold spring, but none of them seems to be entirely satisfactory.

We suggest that we are experiencing one of those changes of our way of looking at life which used to take many centuries in times of old, but which require only a few years now.

There was a time in the history of mankind when practically all human effort was concentrated on the procuring of food. Any amount of labor and risk were cheerfully assumed when there was promise of something to eat.

If the hunt was successful, then there was food, and clothing was a gratuitous byproduct.

As people advanced in skill and knowledge, the food problem became simpler and there was energy left for other things, such as clothing, housing, ornamentation. The relative value of these items was not always the same. For example, the present man or woman who would not think of wearing the embroidered velvets of the knights and ladies of old, because the cost would be too high, would scorn to be satisfied with the housing, the furniture or the sanitation of those times. The relative value of these things has changed, though it took several centuries to effect this change.

Nowadays such changes in the relative value of things come in a few years, thanks to the numerous mechanical inventions. Not so long ago clothing was the most desirable thing to show opulency, as well as the most natural thing to make the feminine part of the human family happy. At the present time people seem to get more bliss out of automobiles, radio sets and movies and as one cannot eat his cake and have it, the man of limited income is compelled to ignore some of his desires and confine himself to what, in his opinion, gives him the greatest amount of happiness for his money. Not only that, but a great many people are in debt for their cars and their radios, so that their purchasing power is limited to immediate necessities. We would not have felt it if there had been time for gradual adjustment but the thing has come overnight and we are wondering what has happened.

Something About Shoe and Wedge Work

By Frank A. Stanley

Certain features of practice in laying off and finishing shoe and wedge faces to bring driving axles square and at correct center distances.

VARIOUS railroad shops have developed their own methods of accomplishing the important operations of laying off and machining shoes and wedges for locomotive driving-axle boxes, and a diversified practice is to be found if a number of plants are visited at different points. In fact, the same shop often makes use of different methods of doing this work, according to the crew that handles the job. This is due to the same reason that a dozen die makers, set to the task of producing a similar set of tools, will each approach the problem from an angle determined by his personal experiences. In other words, the shoe and wedge job, like some others in railroad shops, is often developed through the wide experiences of the men composing the crew.

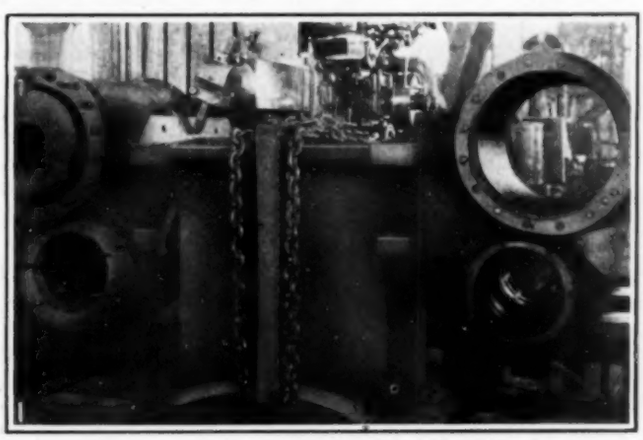
In fitting shoes and wedges for an engine, there are some important points to be recognized regardless of the character of the tools and equipment available for the undertaking. Tools may be of great advantage in carrying out the work, but the satisfactory accomplishing of the task is made possible through the skill of the individual handling the job. The frame of a locomotive may happen to be in bad condition, so far as parallelism of sides and tops, and alignment lengthwise are concerned particularly and if it has been in a collision or derailed. If out of true, the frame must be put into condition before the alignment of shoes and wedges can be undertaken.

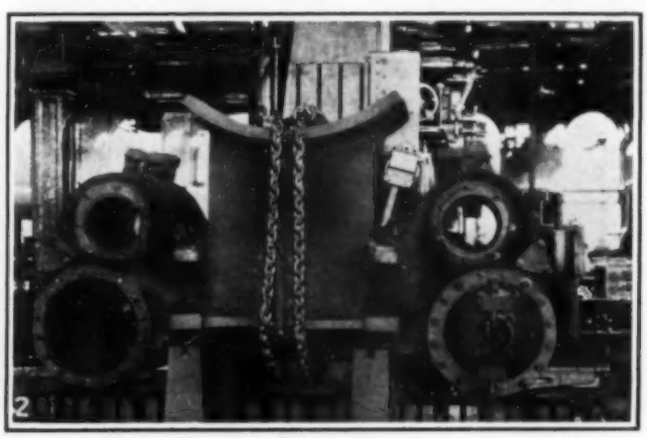
The frame fit on the cylinders provides a location point by which the front ends can be fixed and secured. When reference is made to the method of planing the frame fits, as illustrated in Figs. 1 and 2, it is apparent that parallelism of frames is provided for at the front ends, and that the entire process of machining the cylinders and saddles insures correct position and parallelism of cylinder bores as well as of the frame fits. The cylinders, shown on a draw cut shaper, are mounted on the floor plate of the machine, and the boring of the cylinders and the planing of the frame are accomplished without the necessity of readjusting the work, as the upright column of the machine is moved laterally to provide for both operations. For the planing of the top surfaces, as in Fig. 2, the alignment is secured by locating the surfaces already machined on the finished parallels.

Aligning from the Cylinders

Regardless of whether new cylinders are to be assembled or not, they must form the logical means of alignment and for the checking of the frame from the cylinder bore, which is carried out before actual laying off for the shoes and wedges is started. A modern locomotive frame having a section of about 4½x5 in. is a sturdy piece of work, but when we examine it under the engine and over the pit with the wheels and side motion removed, we can understand the possibility of its becoming bent or sprung by derailment or through some other accident. Even under normal conditions of service, the wear and weave is likely to loosen the lower-frame braces and ties, allowing the main frame to open or close along the lower edge. In lining up the frame, this must be taken into consideration and corrective measures applied if required.

In Fig. 3 the diagrammatic sketch shows a side frame, bent behind one pair of pedestal jaws, that would have its two side members parallel with each other, yet make the squaring of the shoes and wedges impossible. For aligning such frames, a line is stretched through the center of the cylinder bore and to a post secured to the shop floor, independent of





Figs. 1 and 2—Planing the top and bottom frame fits on locomotive cylinders

the engine frame. Heat applied to the bend, indicated at *AA* and the use of jacks at the rear ends, aid in straightening the frame parallel with the cylinder axis.

Among special appliances, developed at the Southern Pacific shops at Sacramento, is a double-head tool, similar to an adjustable T-square, and a holding fixture for the test lines when they are set coincident with the cylinder axis. In Fig. 4 is shown the general arrangement of the square and at *B* is the adjustable device for the outer end of the line. This device consists of a clamp adapted to fit the top of the frame with a sliding block at its outer end that is traversed in and out by a crank and screw, allowing the aligning cord to be set sidewise to the cylinder center. The movable jaw carries an adjusting screw on to which the line is attached. With this screw, the line is moved up or down to a central vertical position for parallelism with the cylinder bore. A similar device is used on the opposite side of the engine so that the extended lengths of the two lines may be used to check each other. The double T-square when placed against the pedestal jaws can be used to determine if the jaws are square with the center of the cylinders. The square is made of flat steel, heavy enough to avoid springing and yet stiff enough to obviate deflection. Both beams are tongued and can be extended to any desired required length. When shoes and wedges are to be fitted to frames, a straight edge is applied across the tops of the two side frames to test their accuracy and together with leveling tests provides for a practically true plane to lay off a reference line as shown in Fig. 5. This line is located an inch below the edge or at any other convenient position. The center of the middle pedestal-jaw opening is found as at *A*, and the point *C*, located at a distance equal to one-half the width of the driver box plus one inch, is used for a center point from which *B* is located, being the same distance as *AC*. Using *A* and *B* as centers, arcs are swung to intersect at *X*, on the side of the shoe. Similarly, another point is swung near the bottom of the shoe, and *X* and *Y* thus lie in a line perpendicular to the horizontal reference line along the side of the frame. By repeating this on the opposite side frame, the spotted centers on the shoe surfaces will be in a vertical plane square with the longitudinal axis of the frame and square with the lines through the cylinder centers. Before removing the shoes, another center mark is made on their inner faces opposite *X*, by a straightedge or square. This gives on each shoe or wedge, a third location mark so that it is a simple matter to set the shoe up in a fixture by applying a height gage to these punch marks brought into the same plane. Various methods are used for the shaping or the planing of shoes and wedges. The fixture shown in Fig. 6 has four adjusting screws *A* that come up under the work. After the shoe is located according to the center-punch marks, the clamp screws *B* are used to hold the work securely. Another method shown on the shaper, Fig. 7, consists of a vise, with short jacks *A* between the sides of the work, to prevent springing under the clamping action. Using the central pedestal jaws as a working point, the forward and rear jaw openings can be laid out and the shoes and wedges laid off in the same manner. Care must be used when applying the trams to avoid an incorrect measurement being transferred to the work. The trams used at the S. P. shops consist

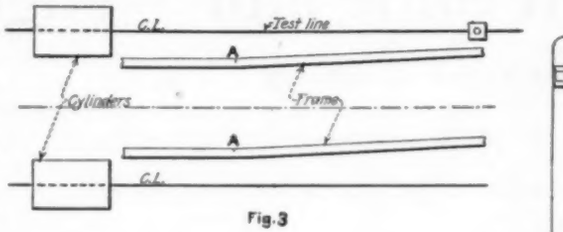


Fig. 3

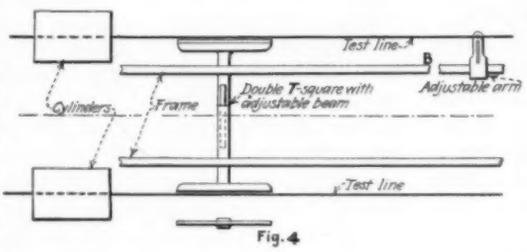
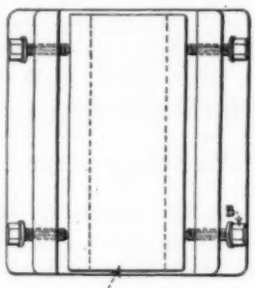


Fig. 4



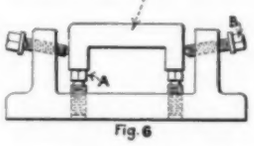


Fig. 6

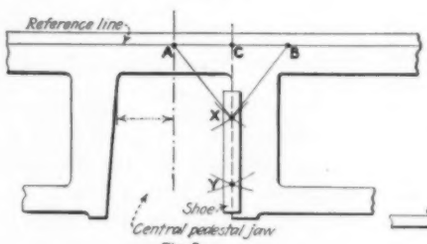


Fig. 5

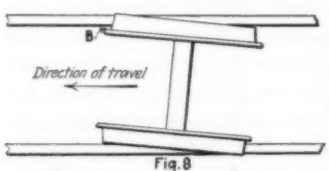


Fig. 8

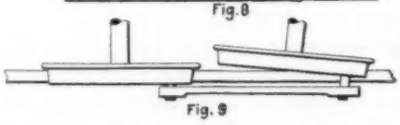


Fig. 9

Fig. 3—A set of bent frames. Fig. 4—Double T-square for aligning frames. Fig. 5—Application of a working line. Fig. 6—A planer chuck for shoes and wedges. Fig. 8—An axle out of line. Fig. 9—Effect of axle being out of parallel

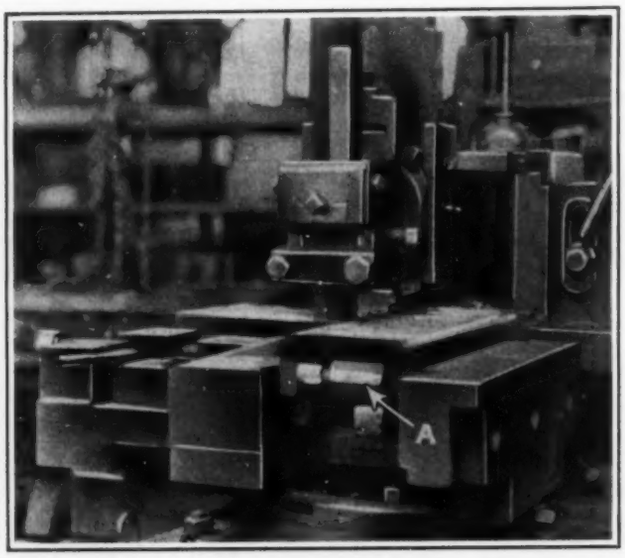


Fig. 7—Finishing shoes and wedges in a draw-cut shaper

of a seasoned bar, 1¼ in. square, with the tram points carried in sockets that are opened on one side so that they are readily placed over any one of the four faces of the beam. The clamp screw rests on a flat plate that bears accurately upon the wood bar, lessening the chance for the surface of the wood from becoming scarred and preventing an accurate setting. A further feature is the form of the tram point, made with a body eccentric to the point so that by turning the steel shank in the socket the point is adjusted as desired. The distance between points is obtained by long scales used solely for this work that are kept in cases to insure protection from improper usage.

If a driving axle is out of square with the frame or not parallel with the other axles, the wearing effect on wheel flanges is very pronounced. Fig. 8 shows an extreme condition with the leading side of the flange bearing hard against the inside of the rail. This condition results in the flange cutting along surface *B*, so that in a comparatively short time it will require re-truing or re-tiring. Another effect from axles being out of parallel is the excessive friction and wear on rod brasses and crankpins. Fig. 9 shows the angularity exaggerated to bring out this point.

Foundations for Machine Tools

BY W. EDWARD

A 113-in. lathe, 65 ft. in length by some 13 ft. wide, that will swing work weighing 300,000 lbs. is being set, at this writing, on adjustable wedges. Sixty of them are distributed to the best advantage under the base.

Each wedge consists of three parts, a lower section approximately 12 in. in width by 14 in. long, finished top and bottom to include an angle of 14 deg. At the upper end of the incline is a lug that forms the support and backing for a 1¼-in. special bolt which is free to turn but constrained from endwise motion in the lug.

This bolt threads into another 12x14-in. block, finished top and bottom, to slide on the lower section and to fit under the bed of the lathe. The lower block is imbedded in the concrete while the other will be free to move as the turning bolt is adjusted. The bed is, of course, provided with the usual foundation bolts.

It is a point that the wedges now going into place to carry their burden are the ones upon which the machine was built and lined up on the manufacturer's floor. It is significant that these wedges served to support and align and realign the ways as the work progressed, resting as it did on the plain factory floor with trains thundering by not fifty feet away.

Is it not reasonable to suppose that when the equipment goes into service to turn and finish the rotors for some of the world's greatest generators the trouble so often experienced with misalignment on the average factory foundation will be avoided?

As the foreman of erection with his 35 years of experience said, "When we first had her finished there was a considerable amount of settlement into our wood floor whenever the trains went by. It was quite a task to keep the last thousandth out of that 65-ft. frame. But finally we made it, and our test cut was dead true. Whoever it was that thought of putting those wedges in the working foundation had a thought worth thinking."

Conservation of Scrap Iron and Steel Growing in Importance

Iron and steel scrap is a far more important factor in steel making than is generally realized. The industry has been organized on a national scale as we know it today only about twenty-five years. The war emphasized the necessity of scrap as a secondary source of raw material for the iron and steel industry. There are in the United States approximately 3,000 scrap iron yards, involving the investment of millions of dollars, employing probably 50,000 workers and an additional 150,000 scrap collectors who depend on this occupation for a livelihood. Sources of scrap are as varied as the uses of iron and steel, although the greater part of it comes from a few well-defined sources. This information is contained in a report issued recently by the National Bank of Commerce, in New York.

THE SCRAP DEALERS' PART

Some manufacturers owning furnaces utilize their own scrap materials. Others on account of limitations in the size of their business produce insufficient scrap of the desired classification to supply their needs. These sell their various grades through the scrap dealer who serves as a clearing house for waste materials, and in turn they purchase from the dealer the grade of scrap desired. It is the duty of the scrap dealer to sort down and classify the numerous receipts and supply the demand wherever needed with the grades and qualities desired.

About one-fourth of the scrap supply is derived from the railroads. About 35 to 40 per cent is industrial or "works scrap" produced in various iron and steel works and rejected in the process of manufacture. This is the most important source and scrap of this class has been conserved consistently by the industry. The remaining 35 per cent is derived from the dealers' scrap iron yards. It consists of material purchased from railroads and industrial plants together with supplies gathered from urban and rural districts by collectors who ship it to the large dealers.

USED ON LARGE SCALE

In the early years of the industry when the output of basic pig iron and steel was but a fractional part of the present output the proportion of scrap used was 50 to 60 per cent of the total raw material going into basic open-hearth steel. The higher percentage of scrap used in the early years of the basic open-hearth process was due probably to relatively large amount of scrap available in comparison to the amount of basic steel produced.

The introduction of this process was really the big factor in making possible the conservation of scrap on a large scale. Since there was no extensive outlet for scrap iron prior to the widespread introduction of this method, obviously there were relatively large accumulations of scrap which were conducive to its use in large proportions.

In the years since the war there has been a tendency for the proportion of scrap used to increase. The coal strike of 1922 made pig iron hard to get. As a result the supply of available scrap was pretty well cleaned up so that in 1923 it was necessary to use more pig iron, the usual amount of scrap not being available.

Increasing Speeds with Spur Gear Speed Reducers

By Francis A. Emmons
Foote Bros. Gear & Machine Co.

COMMERCIAL prime movers generally operate at higher speeds than the machines or equipment which they drive, and in some instances, where it is desired to drive equipment at higher speeds, provision must be made for stepping-up the speeds of the prime mover by some intermediate equipment.

It might appear that a speed reducer could be used in every case to increase speeds by simply reversing the connection; connecting the slow-speed shaft to the prime mover instead of the high-speed shaft. There are certain limitations to the use of spur-gear speed reducers for increasing speeds due to the high torque developed by the prime mover to start the driven unit, particularly where the ratio of speed increase is large.

Theoretically the same horsepower delivered to a speed-reducing unit is transmitted to the driven unit. However, allowance must be made for the frictional and other losses within the reducer itself. These losses range from 5 to 15 per cent in spur-gear reducers of different designs.

The formula for horsepower delivered by a spur-gear reducing unit is:

$$HP = \frac{P \times DN\pi}{33{,}000 \times 12}$$

Where P = Load in pounds on slow-speed shaft
π = 3.1416
D = Diameter in inches of gear on slow-speed shaft
N = r.p.m.

Torque is expressed by the formula

$$T = \frac{PD}{2}$$

Therefore, substituting equation (2) in equation (1)

$$HP = \frac{TN\pi}{33{,}000 \times 6} = \frac{TN}{63{,}025}$$

or

$$T = \frac{63{,}025\ HP}{N}$$

Assuming that the horsepower delivered by the reducing unit is the same as that delivered to it, we have

$$\left((HP)_1 = \frac{TN}{63{,}025}\right) = \left((HP)_2 = \frac{T_2N_2}{63{,}025}\right)$$

or

$$\frac{TN}{63{,}025} = \frac{T_2N_2}{63{,}025}$$

$$TN = T_2N_2$$

$$\frac{T}{T_2} = \frac{N_2}{N}$$

which means that the torque and speed are inversely proportional when frictional and internal losses are disregarded. When using a spur-gear speed reducer for increasing speeds, a high torque must be applied at the low-speed end, to develop the necessary horsepower at the high-speed end. This applies to other forms of transmission equipment such as pulleys and belts, chain drives and open gearing. For high ratios the torque increases, and it is necessary to provide excessive power at the slow-speed end to start the driven unit.

Increasing speeds with any form of transmission equipment may be compared to the efforts of a man trying to use a lever to lift a weight with the fulcrum at a point near his hands. As the fulcrum is brought nearer to the end at which the force is applied, the pressure required to lift the weight increases. This corresponds to the additional torque required to increase speeds at higher ratios.

For low ratios, not exceeding 12 to 1, reducers may be successfully used as the speed increases. When commercial gasoline engines, steam engines and synchronous motors operate at low speeds for the direct drive of rotary pumps, compressors, fans and similar equipment, speed reducers offer a compact, efficient and safe means of transmitting power and increasing speeds.

Two Drilling Operations

The operation of simultaneously drilling the 12 small oil holes under the scraper ring of an automobile piston, is shown in Fig. 1. The piston is held in the center of the machine in which there are 12 radially-

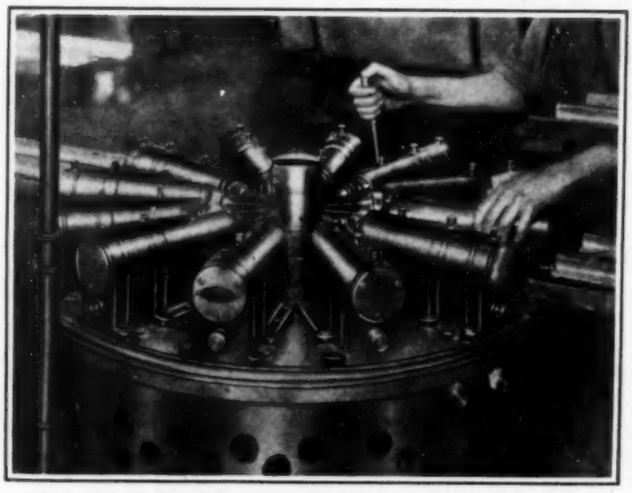


Fig. 1—Device for drilling oil holes in pistons

disposed drilling heads. Each head is driven by an individual motor located in the base of the machine. Should any head be temporarily put out of commission, a duplicate head is available to take its place.

In Fig. 2 is shown the drilling of a camshaft through

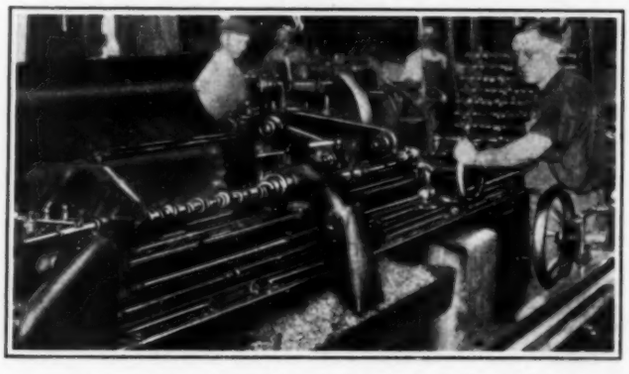
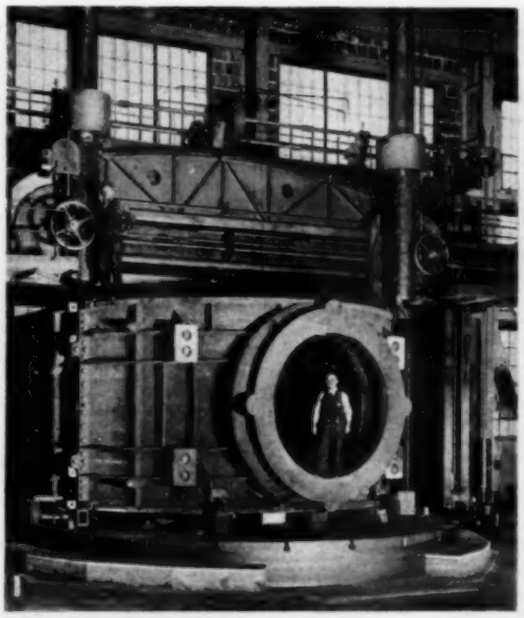
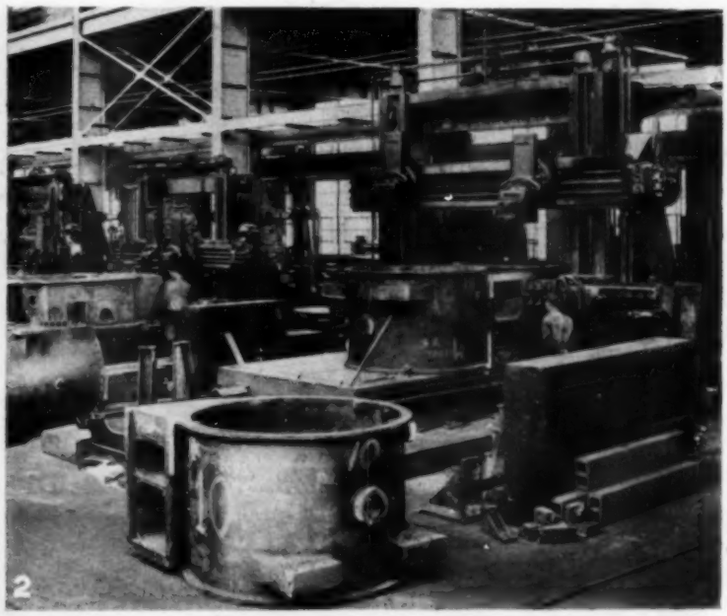


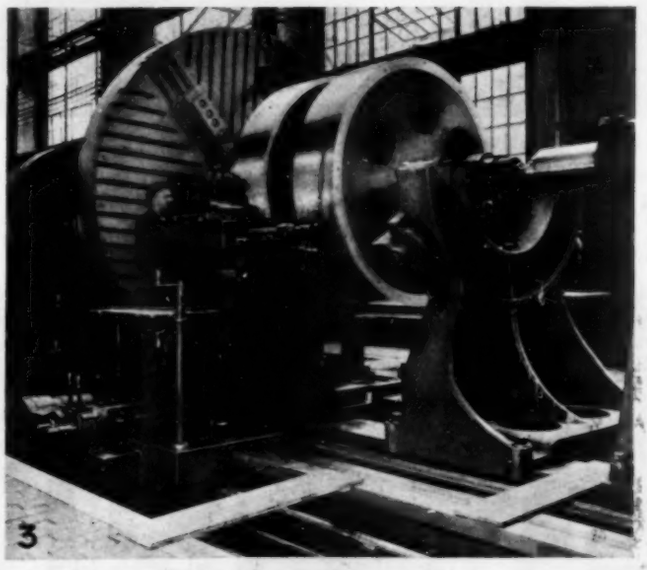
Fig. 2—Drilling a hole through a camshaft

its entire length, the length of the shaft being 30 in. The drill is provided with the usual holes for the passage of lubricant, which is carried to the drill point under a pressure of 2,000 lb. per square inch.

Both of the operations are performed in the Chrysler automobile plant.







Machining Large Turbine Parts

1—Boring large turbine cylinder on 32-ft. boring mill

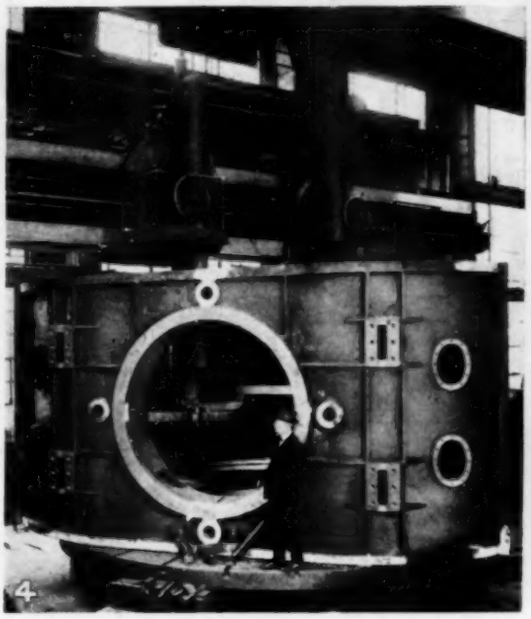
2—Planing condenser shells

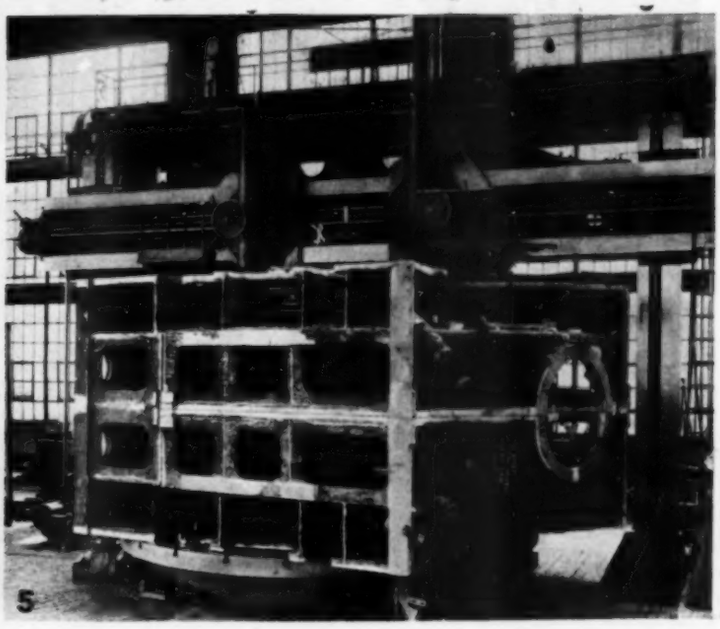
3—Turning rotor in 160-in. lathe

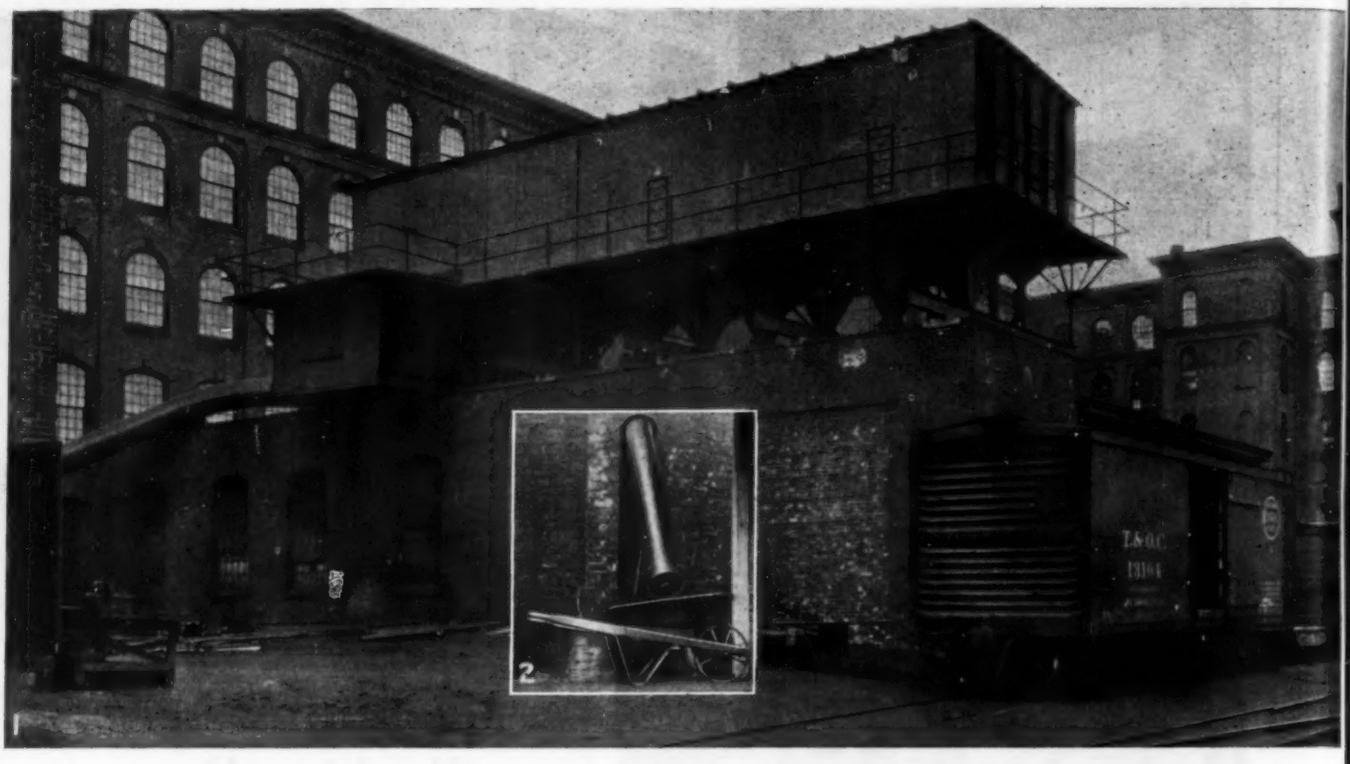
4—Boring cylinder base on 28-ft. boring mill

5—Capacity-job on the same mill

Photographs by courtesy of the Westinghouse Electric & Manufacturing Co.

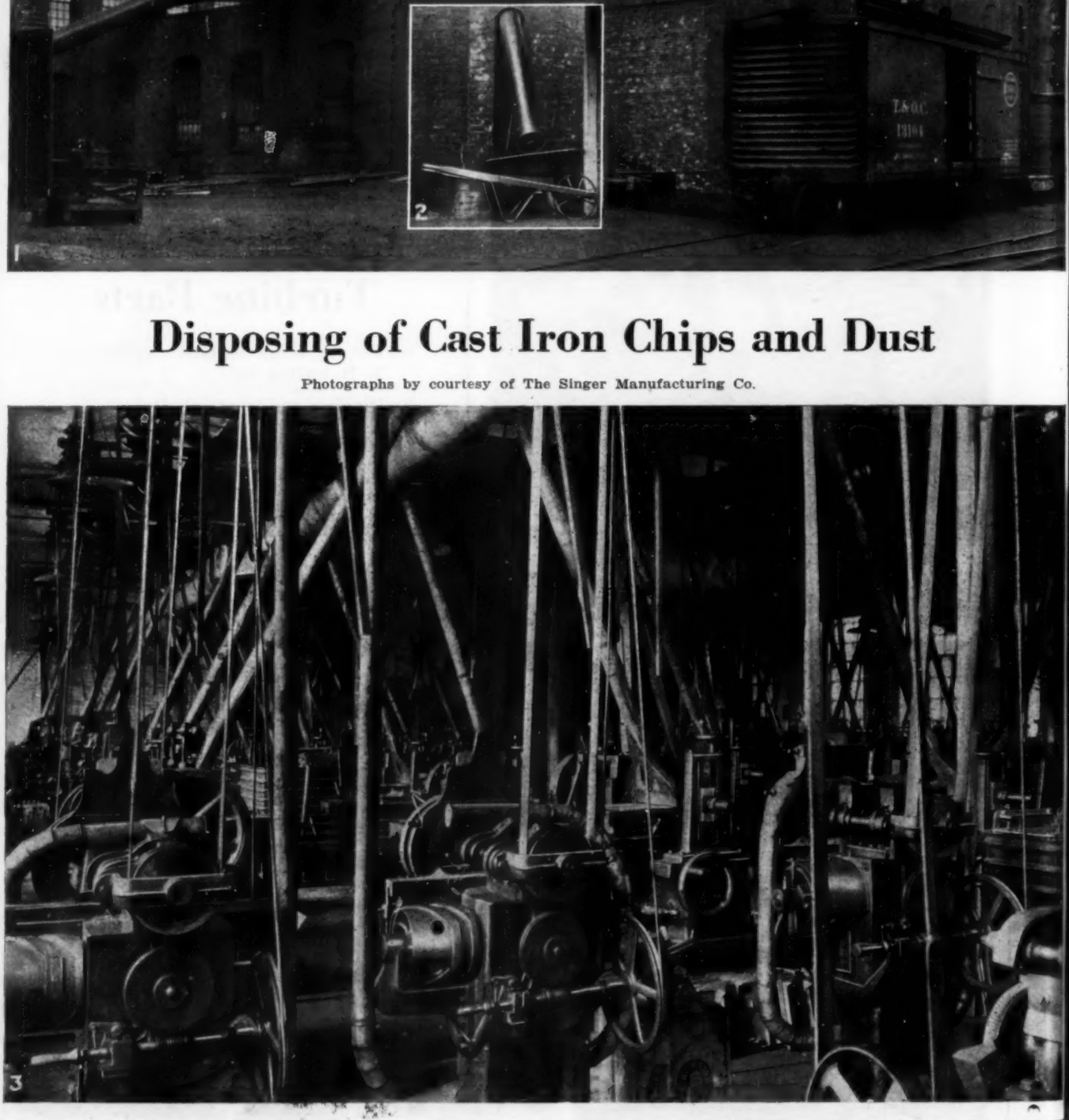


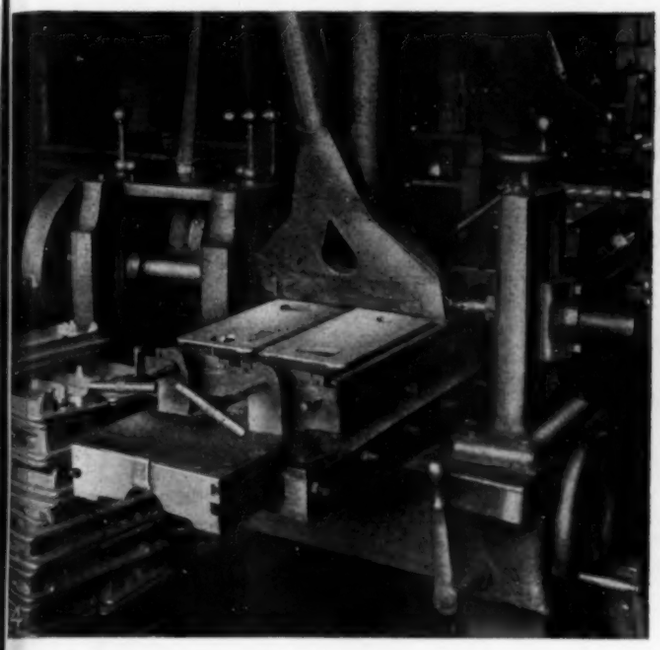


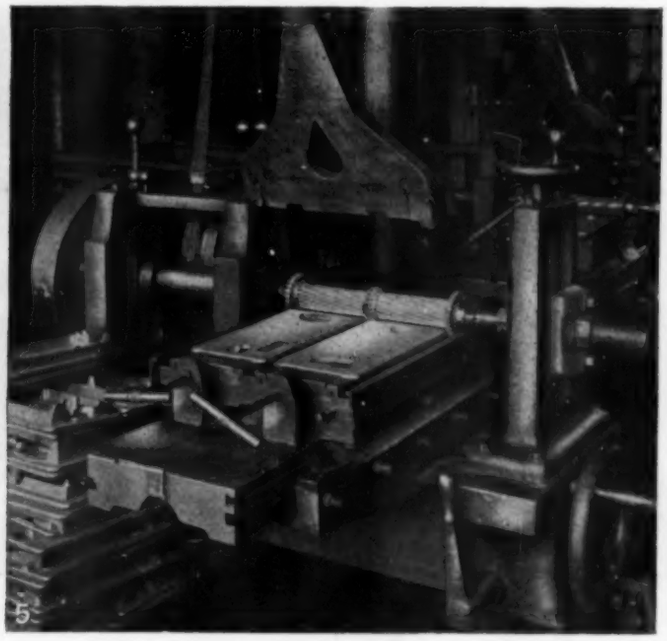


Disposing of Cast Iron Chips and Dust

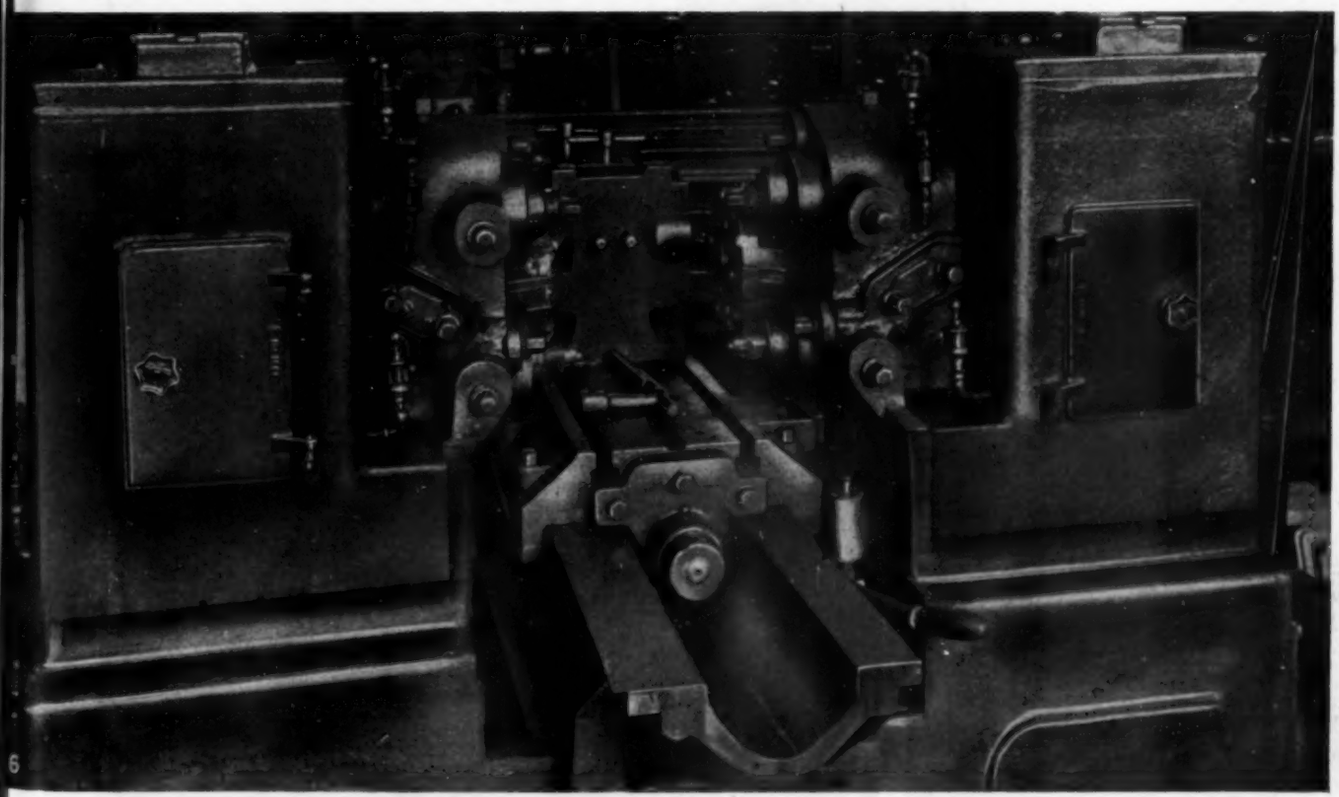
Photographs by courtesy of The Singer Manufacturing Co.

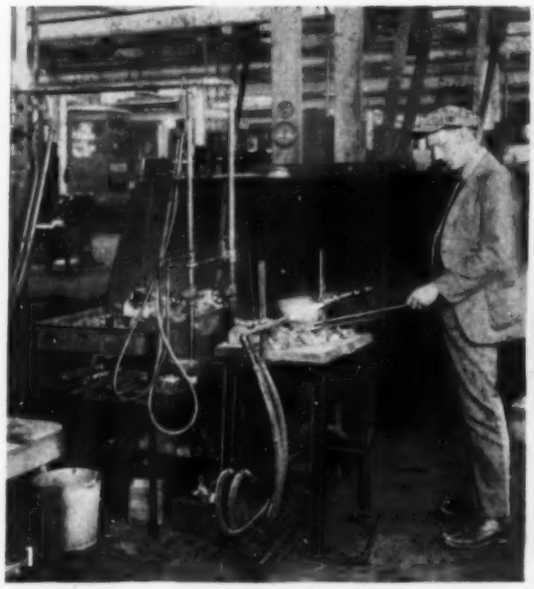






AT THE Elizabethport plant of The Singer Manufacturing Co. the cast-iron-dust collecting system illustrated has been installed in the bed milling department. The collector house is shown in Fig. 1 with the dust discharge pipe appearing in the inserted Fig. 2. In Fig. 3 is a general view of the bed milling department showing the dust collecting pipes. A collecting hood as arranged to surround a gang of milling cutters appears in Fig. 4. The same hood raised to give access to the cutters is shown in Fig. 5. A recent machine, designed to take advantage of the dust collecting system is the subject of Fig. 6. Note the ports on either side of the table to lead the dust-laden air down to the collector. The air stream helps appreciably to cool the cutters.





Side Lights on City Service

1—Brazing stands

2—The forge shop

3—Shop transport

4—Treating a minor accident

5—Hammering home the safety idea

Photographs by courtesy of the Boston Elevated Railroad

Exporting Machinery on Credit

By W. H. Rastall

Chief, Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

The great majority of machinery export transactions do not need to be handled on a credit basis —Practice of exporters in Germany and England

AMERICAN manufacturers of industrial machinery for well over a decade have frequently been exposed to discussions designed to persuade them that they must extend unusual credits if they wished to promote their export business. Such instances as the following are familiar:

"The expansion of business relations between the United States and Brazil depends fundamentally upon two factors: Teaching firms in the United States that longer credits must be granted for the payment of bills. . . . A company selling plant equipment cannot expect to succeed in Brazil unless they are willing to offer more than the usual ninety days for settlement. Europeans are willing to grant six months or even one or two years for textile installations, railway supplies, and purchases of a similar kind. One firm recently offered to sell railway equipment on a fifteen-year basis, agreeing to take state bonds."

"German manufacturers and later on also the English machinery makers are making almost incredibly easy terms of payment extending credit even up to five years."

The following is from a letter from a business man in Germany to another in New York:

"As I told you when in Thoune, German machinery manufacturers have not only offered, but accepted payments for machines delivered from three to five years. . . . Please remember that some British manufacturers have offered to sell at the same conditions. You know, yourself, Spanish conditions well from your former visits to this country and you will doubtless remember that even before the war German manufacturers made always very easy terms and extended long credits."

A further example is from an item in a technical magazine:

"In spite of the catastrophal economic and political conditions prevailing in Germany, the German iron masters conduct their fight of competition abroad now as before, with undiminished vigor. Not only very low prices are made, but almost incredible and ridiculous terms of payment are granted. Thus, for instance, the General Electric Company of Berlin (A.E.G.) recently received an order from China . . . for which the General Electric Company of Berlin made the following terms of payment: One-fourth of the total price of installation one year after arrival at the plant at Shanghai, the rest within the following four years, without payment of interest. The price at which the German concerns sold this machinery installation was about 25 per cent below the net cost to the Swiss Company. Swiss manufacturers could never accept such terms of payment—so your correspondent was told—as every bank would at once withdraw every credit from firms practicing such business transactions."

The testimony contained in the above quotations is so persistently supported in newspapers, technical magazines, consular reports and by returned travelers that an examination of the subject is of great interest to those engaged in exporting American machinery.

It is interesting to note that insistent as the demand for credit may be, and coming from many widely-separated countries, it is not universal. At the moment, no instances are recalled where such credits have been demanded from the United Kingdom, from France, from Belgium, or Canada. Many American machinery manufacturers, accustomed as they are to the practice of prompt payment in the domestic market have been greatly disturbed by the insistent demand that machinery for export be sold on credit. In some instances this has resulted in causing certain managers to lose interest in export business, while in other instances, it has resulted in the acceptance of export business on terms that were scarcely businesslike. All of this is most unfortunate, as American machinery manufacturers have every reason to be proud of their export business, and the terms on which it has been handled. In spite of the high wages paid American mechanics, the United States today is probably the world's most important exporter of machinery, having shipped more than $130,000,000 worth of such equipment in 1924, generally distinguished for superior engineering merit and usually commanding prices far above material offered from other countries. Probably ninety per cent of this large volume of machinery is fully paid for, in cash, to manufacturers before it leaves the United States. Properly handled, American machinery manufacturers should find their export business the cleanest and most attractive executed by their plant, for payment is usually made promptly against American delivery and petty demands from customers for service and other trivialities are reduced to a minimum; the sales expense is commonly carried by machinery dealers in foreign countries, and in a great many other ways these export transactions should be found most desirable. Obviously the business should not be handled on a credit basis by the manufacturers unless there are special considerations making this necessary.

Factory Equipment Versus Merchandise

At a recent foreign trade convention, at least two speakers, in discussing export trade, made the statement that no manufacturer should consider going into the export business unless he were prepared to grant credits to foreign buyers. Such sweeping statements are unfortunate and unfair unless commodities are mentioned, as terms of sale may be applied to some which are not appropriate for others. The writer happens to know that one of these convention speakers had in mind office supplies, and the other shoes. Obviously, shoes or collars, when shipped abroad, will ordinarily pass into the hands of dealers who may reasonably expect to convert stocks into cash in time to meet their maturing obligations. In contrast to this, machinery as purchased by a factory, railway or

mine, becomes plant investment and ninety days' credit should be of little importance to the buyers. If the promoters of the enterprise are to have the cash with which to pay three months after delivery, presumably they have it when delivery is made. If not, it is possible that they are overextended and not only lack the capital required to pay for the machinery but also working capital as well. Quite probably, it is no kindness to furnish such buyers with machinery on credit, as the enterprise may be doomed from its inception. It is much better business for all concerned to require the promoters to find funds fully to equip their enterprise before passing beyond the stage where equipment is purchased.

In some instances, it is felt that machinery can be sold on long credits in such a way as to enable the buyer to pay for it out of profits, but for the ordinary transaction, this would probably, in effect, mean that the machinery manufacturer virtually becomes a stockholder in the enterprise with the further restriction that he would not be in a position to receive dividends. He would be carrying his full share of the risk without being in a position to receive a corresponding share of the profit. Transactions of this sort approach the situation of "heads you win, tails I lose"—a policy that can scarcely be recommended.

Reasons for Extending Credits

Altogether it can probably be said that the manufacturer gets prompt payment for 75 per cent of the machinery entering into international trade, but inasmuch as there remains an important volume sold on credit, it would seem desirable for the American manufacturer to adopt a flexible policy in this connection and export on credit at times if it can be done on a businesslike basis.

However, the manufacturer should be on his guard against adopting this policy to meet what may be termed abnormal competition. For example, in 1924 most German manufacturers were heavily stocked with machinery that had been made while the mark was depreciating, produced at perhaps 25 per cent of what it would have cost to build it in America. Later, following the stabilization of German currency and the inauguration of the Dawes plan, these manufacturers found themselves short of working capital. They could afford to sell this machinery at ridiculous prices and on any terms that would convert it into liquid funds. The result was that reports were received from all over the world of transactions involving prices that appeared ridiculous and terms that seemed absurd.

England also furnishes a case in point. Following the Armistice, there was great unemployment, and in order to hasten the recovery of business, the British adopted the so-called Trade Facilities Act, which made it possible for manufacturers to secure Government guaranteed loans, and machinery was exported to Poland, India and certain other countries on credit which these loans made it possible to grant and with the terms supported by government guarantee.

Experience under the above Act, by the way, provides an interesting opportunity to estimate the importance of credit transactions in connection with machinery exports. During approximately three years that it has been in operation it appears that the facilities of this Act have been employed in connection with export machinery transactions in only three or four instances. One of these was for a large volume of textile machinery shipped to Poland, and another was for hydro-electric equipment shipped to Bombay. Early in 1925, the British Government reported that during the life of the then existing Ministry, that is to say, from October, 1924, out of 1,123 applications under this Act, only 84 transactions were sanctioned, the value involved being £447,207, that is to say, the average transaction represented £5,324. Many of these transactions applied to work inside the United Kingdom and the sums applied in promoting the export of British machinery were negligible. These facts suggest that the demand for credits in connection with the sale of machinery are not as active as some of the above quotations suggest.

Instances Where Credits Are Extended

At the annual meeting of Platt Brothers & Co., Ltd., well known British manufacturers of textile machinery, the chairman included the following paragraph in his speech to the stockholders:

"Sundry debtors at £1,005,682 compares with £1,133,335 a year ago. The amount is large, because it is necessary in these days occasionally to give extended credits. Our policy is to help the cotton trade over its difficulties, where such a course is necessary or desirable, rather than to harrass those who are temporarily unable to pay and that policy has been justified by results in past years."

Certain business interests in Spain regularly extend credits on machinery transactions extending from six months to three years. In Latin America and certain other parts of the world, a similar business situation is encountered resulting in a form of competition that is exceedingly difficult for the smaller American machinery manufacturer to overcome. This situation suggests that business houses regularly extending these credits have discovered a method that makes such business possible and it would be of great interest to American manufacturers to discover such a method on behalf of their own interests. In this connection it should also be remembered that foreigners extending such credits are not necessarily more successful in their export business than are American manufacturers that content themselves with a more conservative policy. All over the world are instances where machinery has been sold on credit, only to develop complications in connection with collections. In China, in Poland, in Rumania, in Spain, and in India there are glaring examples of such experiences. Clearly, it is desired that manufacturers refuse to sell on credit unless they can discover methods that will make it possible to handle such business safely and cleanly. On the other hand, it would promote American interests in the face of world-wide competition if methods could be discovered making such credits possible.

Credits on Certain Machinery Transactions Necessary

Still it is undoubtedly true that by extending credits, particularly in certain countries, a largely increased volume of export business can be secured, and there are reasons why machinery purchasers in these countries wish to buy on credit. For example, in Brazil there is a great need for capital, if industry is to be developed. As yet no business processes have been developed there to take care of the financing of industry through long-time industrial loans in foreign countries, and there is no means for raising capital through investment securities in the local market. Consequently, industrialists in Brazil find it necessary

to raise all of their own capital or else arrange to finance themselves through their suppliers. Where a manufacturer in the United States would raise capital for any industry, by the sale of mortgage bonds, a similar manufacturer in Brazil must plan to reach the same end by pushing the burden on to the machinery dealer. Otherwise expressed, the demand from Brazil and certain other countries for long-time credits in connection with machinery transactions represents a demand on the part of the industrialist there that the machinery manufacturers shall participate in his business to the extent of the investment represented by the deferred payments on the machinery contract.

Relations Between Bankers and Manufacturers in Europe

In a discussion of this sort it should be remembered that the business communities in European countries have a very different form of organization from those known in the United States. On account of interlocking directorates, the relationship between banks and manufacturing enterprises in Europe is often very intimate. European banks also are not restricted in the manner common under certain American laws and consequently are in a position to handle business that here might prove illegal. It is not uncommon in Europe for a bank to hold control over an industry through ownership of a majority of its stock and in some instances these interests are very extensive with ramifications into many countries. It is understood that in some instances these European banks will discount the paper of machinery dealers who have sold such equipment on the terms indicated in the above quotations. In cases where the machinery manufacturer can discount such paper at his bank without recourse, it is clear that credit business becomes very attractive. For example, if a German salesman in Ceylon accepts an order involving six months' credit, it is possible that the manufacturer will execute the order in the usual way, sending the usual documents forward with the consignment. On arrival of the goods, the salesman secures from his customer an acceptance which in turn is discounted at some bank, thus providing funds to meet the draft accompanying the consignment, and the transaction ends with the manufacturer fully paid and the bank extending a credit to the local industry on the security of an acceptance. If this acceptance is discounted without recourse, the manufacturer has no further responsibilities whatever. There are countries where customs make it possible to handle business in this manner, but there are other countries where it would be found difficult. Another way has been for the German manufacturer, for example, to discount on his own part in the London market. In pre-war days it was sometimes possible to do this on something like three per cent, so that by lending his credit, the German manufacturer was able to make from three to five per cent interest on the deferred payments during the life of the credit in addition to his usual manufacturing profit. Under such conditions, credit transactions were probably attractive, although they involved the manufacturer in serious contingent liabilities.

Methods by Which Credits Can Be Extended

Investigations made by this Bureau suggest that generally speaking American manufacturers should demand payment on exported machinery before the equipment leaves the United States. This rule will probably be found entirely satisfactory ninety per cent of the time, and ninety per cent of our machinery manufacturers will probably find this method entirely satisfactory for all of their business. It can probably also be added that no machinery manufacturer should consent to export machinery on any other basis unless he has a well-developed export department, which is fully equipped and fully competent to handle foreign business of this character. Under conditions existing in various foreign countries, these credits have sometimes been subject to serious abuses and the process of collecting for such items in case of difficulty are complicated and intricate and call for very careful work.

Experience also indicates that where credits are extended foreign machinery manufacturers frequently arrange to have the transaction guaranteed. In Spain and Poland and certain other countries, banks are accustomed to such business and are prepared to make these guarantees.

German industry has long been supported vigorously by German banking institutions employing methods that could scarcely be used in the United States, so that even if German manufacturers are in a position to sell machinery on credit, it does not necessarily follow that American manufacturers would be in a position to handle their business on a like basis. If this represents a deficiency in the American banking system, it may be that it is a matter that our manufacturers should call to the attention of our banking community and our law makers.

Deficiency Is at Home

It should be remembered that other industries that have felt the need for credit in connection with their export business have themselves organized special corporations to finance these credits. For example, in the electrical field for domestic transactions we have the Electric Bond and Share Company, and for foreign business we have the American and Foreign Power Corporation; in the automotive field we have the General Motors Acceptance Corporation. Other similar financial institutions have been organized in Europe, as well as in this country. If there is a deficiency in the existing American banking system, it might be implied that it is necessary for Americans interested in machinery to organize a similar financing corporation.

It is also possible for an American machinery manufacturer to arrange for credit in connection with his export transactions by having these credits insured through companies equipped to underwrite such transactions. So far as is known, such insurance protects only against bankruptcy and present facilities cover transactions involving six months or less. Credits of this kind might be a great convenience to a machinery dealer abroad who would thereby be unable to collect from his customer before finding it necessary to meet all payments in connection with the transaction. Manufacturers might find it profitable to study facilities of this character now in existence, and where it is found that a six months' credit is adequate, would possibly be able to promote their foreign business by employing such methods. Such transactions, however, imply that the manufacturer be adequately organized for the handling of such business.

Before determining the policy to be used in connection with its export business, a manufacturing organization should consider how this policy will tie in with

its other business policy. Although some of our machinery manufacturers have very elaborate organizations, the majority find it necessary to content themselves with modest office forces, and when all business is conducted on terms involving payment f.o.b. factory, a very simple type of office organization will suffice. So soon, however, as a manufacturer undertakes to handle his foreign business on lines involving quotations for delivery in foreign countries a much more complicated organization is necessary, involving a foreign sales department, equipped for world-wide activities. Obviously, the office that is organized on an f.o.b. factory basis can scarcely measure up to the responsibilities involved in extending credits abroad, while, on the other hand, an organization fully developed on the export side will probably find it possible to consider not only making c.i.f. quotations, but to handle a certain amount of this business on credit. At any rate, a manufacturer should consider carefully the change in responsibility involved in making c.i.f. quotations, as distinguished from f.o.b. factory proposals, and take all necessary precautions in order that his business may be properly handled under these changed circumstances. Correspondingly, if he allows his foreign customers ninety days, after arrival, in which to make payment, he will similarly find it necessary to include in his Export Department such organization as is necessary to consecutively follow the credit standing of his foreign customers, and if circumstances do place him in a position where he wishes to grant three years' credits in connection with machinery transactions, he should simultaneously expand his Export Department so that it will be correspondingly in a position to protect his interests.

Present Business Practices

Careful study of the present situation shows that there is very little demand that machinery for export be sold on credit and this applies to British and continental manufacturers as well as those of the United States. There is almost no occasion to sell machinery on credit in any European country, with the exception of Poland and Spain, although there have been times when requests of this character have come from Germany, Austria and Czechoslovakia. Most machinery sold in Asia is sold for prompt payment. In South America, there is some request for credit, but quite commonly the business can be done on conservative lines. For example, in most of these countries, it will be found that the machinery dealer sells to his customer on some such basis as one-third with order, one-third on delivery, and one-third after test. Such terms enable the dealer to operate with almost no capital. For, after making delivery, he has outstanding only one-third of the contract price minus his own profit, while during the early months of the period involved, he has had the use of his customers' money to the extent of one-third of the contract price. It is felt that such terms are entirely businesslike and protect the interests of all parties of contract.

Unbusinesslike Methods Sometimes Practiced

During the War, as a military measure, allied interests arranged for the liquidation of certain German firms engaged in business in Hongkong and Singapore, and those in charge of these liquidations have reported that they found many of these German companies in a most unsatisfactory position. Credits had been extended in a most unbusinesslike way and companies that had seemed to be most prosperous were in reality found to be almost worthless. Time and again foreign markets have been demoralized by the too liberal extension of credit. Not long ago a firm in Spain was liquidated, involving a number of American manufacturers in serious losses. Large companies and small companies, British and German, as well as American, have suffered serious losses through the too liberal extension of credit in connection with export business.

The export manager will find it much more difficult to secure satisfactory credit information than will his associates handling domestic business, and in general it is felt that great caution should be exercised in following recommendations to be liberal with credit. The greatest effort should be made to keep export business on a basis that is clean and attractive. Properly handled, these export orders should be the most attractive received in the shop, but if the export business is allowed to become involved, it will also be found that collections are difficult, litigation hampered, and prospective profits will quickly melt away and may become serious losses.

Large Manufacturer Sponsors Safeguarding of Machinery

In a circular recently sent out to the machinery industry, the International Harvester Co., of Chicago, calls attention to the necessity of giving more heed to machine guards. The circular is in letter form and addresses itself to manufacturers as follows:

"We have had difficulty in getting some manufacturers to fully appreciate our requirements with regard to equipping machines with proper guards to protect employees against injury. In a number of instances machines have been delivered to us with dangerous points unguarded. These points could have been covered by the manufacturers with guards better designed and more economically made than we can make.

"We are now vigorously promoting the whole subject of protection against injury in all our plants, and are equipping all machines with every possible device which will safeguard our workmen. We, therefore, wish to urge that in filling orders for the International Harvester Co. in the future, you give the matter careful consideration.

"All machines must have the gears, even where seemingly inaccessible to the operator, completely covered so far as the full circle of the gear is concerned and down to the roots of the teeth. All flywheels, gear wheels or pulleys where spokes are dangerously exposed or unprotected by a shield must have the space between the spokes filled up either in the original casting, making a solid web wheel, or by filler plates which would accomplish the same purpose. This applies whether the wheels are fast or slow moving.

"Every machine should be so planned that it can be stopped and started instantly by the operator by a lever always within easy reach. Setscrews on revolving parts should be set in recesses, and in general all dangerous moving parts should be covered.

"In making the above requests we feel that we are not making an unreasonable demand, nor one which is not thoroughly in harmony with practical tool designing."

Ideas from Practical Men

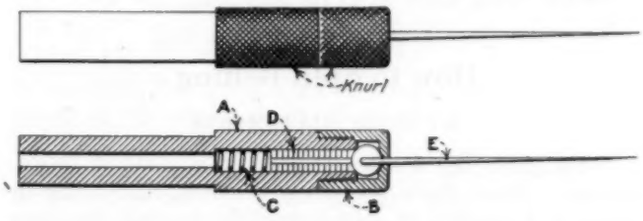
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

An Inexpensive Wiggler

BY E. J. HURLEY

The tool shown in the sketch is a center wiggler or indicator and has the advantage that when one is through using it, the cap can be unscrewed, the point inverted and placed in the shank and the cap screwed on. It is then a small, compact tool with the point protected.

It is composed of five parts, the body *A*, cap *B*, spring *C*, plunger *D* and needle point and ball *E*. The body is made of cold-rolled steel. The large diameter is knurled and one end threaded to fit the cap. The hole is large enough for the coil spring and plunger



An inexpensive wiggler

to fit loosely for about one-third the length. A hole slightly smaller is drilled the remainder of the way and acts as a shoulder for the spring and allows the needle to slip through.

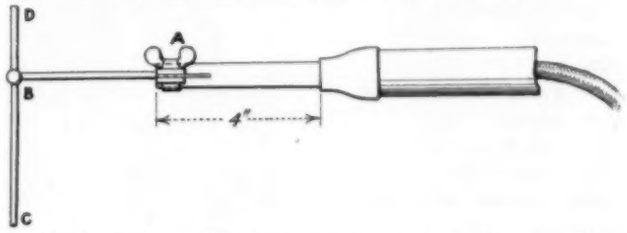
The cap is of cold-rolled steel, casehardened and threaded to fit the body. The end has a hole slightly larger than the needle and is counterbored from the inside to form a seat for the ball. The plunger is made of cold-rolled steel and casehardened. It fits loosely in the body and has a hole through the center to allow the needle to fit loosely. One end is cup shaped for the ball to seat in.

Saving Welding Rod

BY L. D. CASE

A few days ago I noticed lots of short lengths of welding rod lying around the booths where welding is done and it struck me that some means could be devised by which the short pieces could be used. After talking the matter over with the welding foreman, we devised the method of salvage shown in the sketch.

A piece of rod is put in the holder and held by the thumbscrew *A*. To the end of this rod one of the short pieces is welded, as at *B*. In welding, the end *C* is used first and when used nearly up to *B* the holder is turned so as to bring the end *D* into welding position. When end *D* is used up, another piece is welded on.



Method of utilizing short pieces of welding rod

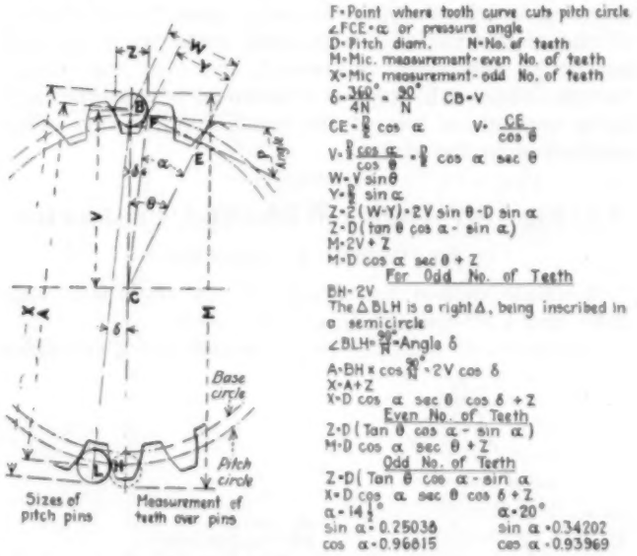
Several holders were made and by their use in the manner described, a saving of three rods per day per man was effected.

Measuring Gears by the Use of Pins

BY ROBERT W. BURGESS

The data shown in connection with the sketch was taken from my data book.

The formulas given, cover all that is necessary in figuring the diameters of the pins to be used in check-


Z
W
Y
A
B
F
E
D
X
α
θ
C
δ
Base circle
Pitch circle
Sizes of pitch pins
Measurement of teeth over pins
F = Point where tooth curve cuts pitch circle
∠FCE = α or pressure angle
D = Pitch diam. N = No. of teeth
M = Mic. measurement - even No. of teeth
X = Mic. measurement - odd No. of teeth
δ = 360°/4N = 90°/N CB = V
CE = D/2 cos α V = CE/cos θ
V = D/2 cos α/cos θ = D/2 cos α sec θ
W = V sin θ
Y = D/2 sin α
Z = 2(W-Y) = 2V sin θ - D sin α
Z = D(tan θ cos α - sin α)
M = 2V + Z
M = D cos α sec θ + Z
For Odd No. of Teeth
BH = 2V
The Δ BLH is a right Δ, being inscribed in a semicircle
∠BLH = 90°/N = Angle δ
A = BH x cos 90°/N = 2V cos δ
X = A + Z
X = D cos α sec θ cos δ + Z
Even No. of Teeth
Z = D(Tan θ cos α - sin α)
M = D cos α sec θ + Z
Odd No. of Teeth
Z = D(Tan θ cos α - sin α
X = D cos α sec θ cos δ + Z
α = 14½° α = 20°
sin α = 0.25038 sin α = 0.34202
cos α = 0.96815 cos α = 0.93969

Data for use in measuring gears by the pin method

ing the teeth on the pitch line, and to find the measurement over the same pins, for gears having both even and odd numbers of teeth.

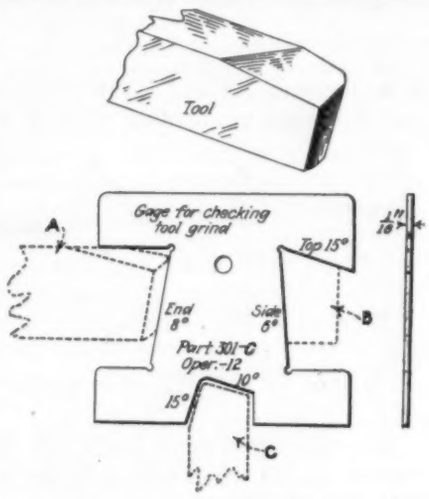
I believe the data to be simpler in form than any that has been published.

IDEAS FROM PRACTICAL MEN

Gage for Proper Tool Clearances

BY FRANK WALDO

Experiments are often made for determining the correct angles for grinding a tool in order to give the longest life between grinds, but seldom is the operator provided with a gage for checking these angles to see if they are in accordance with the recommended clearances. The tool-grinding departments are more apt to properly check a tool than a machine operator, and since correct tool grinding is the success of any metal-cutting operation, some means of insuring properly ground tools should be provided.



A sheet-metal gage for lathe tools

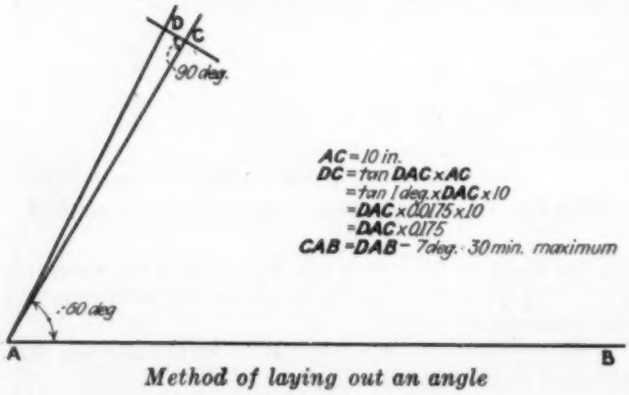
The gage illustrated, made of $\frac{1}{16}$-in. sheet metal, was found useful on a shaft-turning operation where the operator sharpened his own tools, resulting in less grinding and a minimum loss of time. At *A* the end clearance is gaged from either the top or the bottom face of the tool, at *B* the side and top angles or the side angle and bottom face are measured and at *C* the contour of the tool is checked as shown. The operation on which the tool was used, gave trouble if any of the angles varied 2 deg., and, since the eye could not detect this slight difference, the gage was found indispensable. The gage is economical to construct and is an example of one of the small requirements often overlooked in the shop.

Laying Out Angles Without a Protractor

BY HERBERT A. FREEMAN

A simple method for laying out any angle with only a 45- and a 60-deg. triangle is as follows:

Combinations with the two triangles will give angles in steps of 15 deg. making it possible to approximate any angle to a limit of half this amount or $7\frac{1}{2}$ degrees. The problem then is to devise a method to lay out all or a part of this amount without a protractor.



Method of laying out an angle

Assume an angle of 63 deg. and 30 min. to the line *AB* at *A*. Draw line *AC* with the triangles that form the angle *CAB* within $7\frac{1}{2}$ deg. of the required amount. This is obviously 60 deg. which leaves 3 deg. and 30 min. to be determined and laid out.

At a point *C* on the line *AC*, 10 in. from *A*, erect a perpendicular and establish the point *D*, at a distance of 3.5x0.175 in., or 6.125 in. from *C*. The line *DA* will form the desired angle of 63 deg. and 30 min. with the line *AB*. The proof is as follows:

CAB = 60 deg. as laid out.
DC is perpendicular to *AC* as laid out.
AC = 10 in. as laid out.
Assume the angle *DAC* equal to 1 deg.

Then $\frac{DC}{AC} = \tan 1 \text{ deg. or } DC = 10 \times 0.0175 = 0.175.$

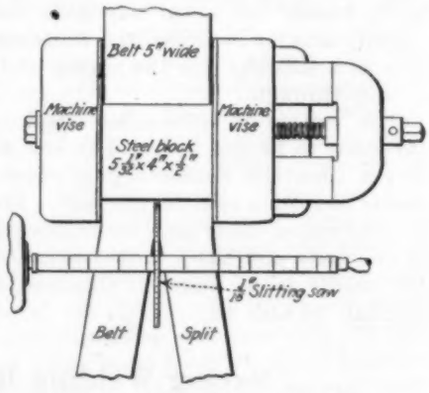
Angle required lies 3 deg. 30 min. beyond *AC*.

Therefore: *CD* required = 3.5 × 0.175 = 6.125 in. and line through *D* and *A* forms the required angle with *AB* within a small error that is negligible for all practical purposes providing the $7\frac{1}{2}$-deg. variation is not exceeded, being 0.007 in. at its maximum.

How to Split Belting

BY DAVID MCCLEMENTS

Some time ago I was in need of a piece of $2\frac{1}{2}$-in. belting. Since there was none in stock, and being in a hurry, I decided to split some 5-in. belting that was in no danger of being called into service. After trying several methods (most of which involved a good deal of manual labor) the scheme shown in the illustration was adopted.



How the belt was split

The vise was put on the milling-machine and a $\frac{1}{16}$-in. metal-slitting saw placed on the arbor. Next I cut a piece of 4x$\frac{1}{2}$-in. steel, $5\frac{1}{32}$-in. long. The belt was laid in the vise, a piece of thin cardboard laid on top and the piece of steel clamped tightly in the vise on top of the belt and cardboard. The cardboard was then withdrawn and the belt had clearance on the sides and top. It was necessary only to center the saw with the inner faces of the vise jaws, put the machine at top speed and push the belt through. This saved me some sweat and the air in the shop was much sweeter, since with this fixture the belt did not require any profanity to aid in pushing it along.

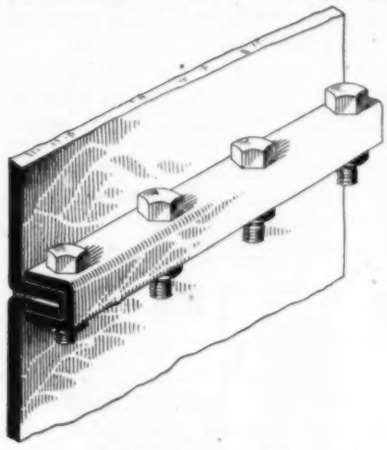
IDEAS FROM PRACTICAL MEN

Reinforcement for a Tank Joint

BY GEORGE A. LUERS

The seaming of tank plates, where it is essential that the junction in the metal be tight and as strong as the adjacent solid members, is a problem in metal working that is not readily solved by the usual buttstrap or overlapped seam.

In the construction of a sectional tank, where it was found the seams could not be made tight by the usual



How the joint was reinforced

flange bolts, the unusual but thoroughly practical means shown in the attached sketch was adopted most satisfactorily.

As will be understood by reference to the sketch, the flanges were held by bolts at close intervals. Leakage however occurred at the unsupported sections between the bolts. Through the use of U-shaped supports or clamps, the flanges of the tank were sealed and rigidly supported.

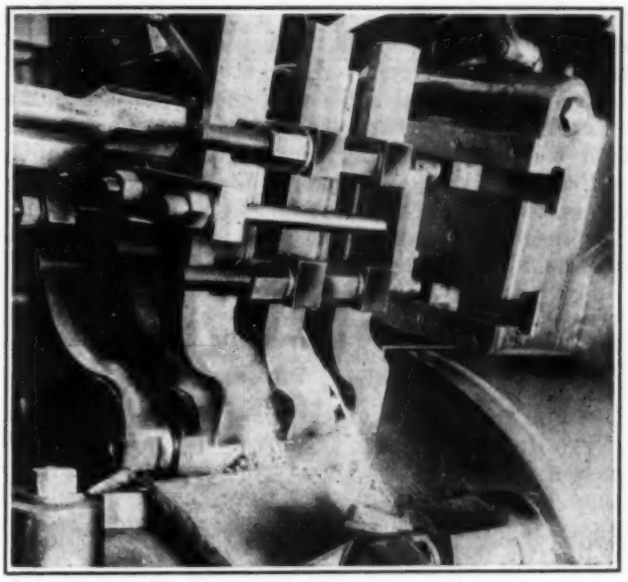
Using Planer Tools in Tandem

BY CHARLES F. HENRY

Cutting the slots in the rotors of large electric generators presents quite a problem in machining. In some shops these slots are milled as was illustrated in the *American Machinist*, some time ago. The rotor shown is in the plant of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., and is built up of sheet-metal disks.

The method of planing shown is unusual, since we seldom see three tools used in tandem in this way. The way in which the tools are held will bear quite a little study. The two tools next to the clapper block are held by the same bolts, two cross straps being used for the purpose. The upper or outside tool is held by a third strap with bolts running each side of the other tools and held by blocks placed under the lower tool strap on each side.

The tools are set so that the front tool cuts a narrow slot, the next a somewhat wider one, while the last tool cuts the full width of the slot. They are all set at the same depth of cut. It will be noted that the second and third tools have special cutting tips welded



Three planing tools in tandem

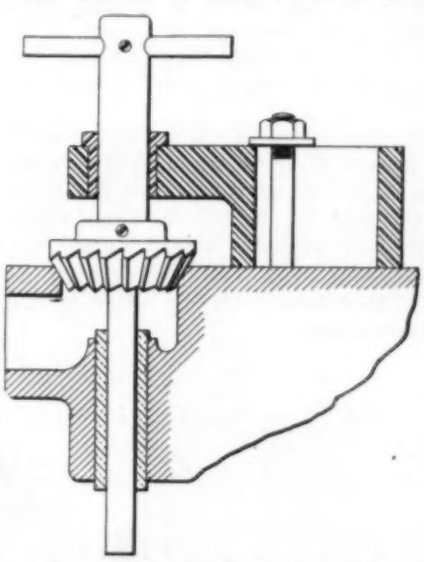
on top of the shanks. It will also be seen that there is a second gang of three tools in tandem at the left, working in another slot. The tools are forged back to give the effect of a spring tool.

An Improved Valve-Reseating Tool

BY C. L. HALL

Most motor mechanics have used more than a few cuss words when they had occasion to use the usual form of valve-reseating tool that is found in most service equipment.

Ordinarily these tools are piloted in the valve-stem bushing only. When pressure is applied to the cross-pin handle, the usual result is to spring the pilot slightly, thereby crowding the cutter to one side and when the valve is tried in the seat it is found that the bearing is far from what it should be. The new seat has been made eccentric with the bushing and probably out of round in addition.



Improved valve-reseating tool

The type of tool illustrated will help to overcome these difficulties. It is the same old type of reamer that has always been used, with the exception that the upper part, or handle, has been ground concentric with

IDEAS FROM PRACTICAL MEN

the cutter and pilot, and fits a bushing in a slotted bracket that is attached to the top of the cylinder block by one of the cylinder-head studs.

It is a comparatively simple matter to locate the bracket so that the shank and pilot of the tool are free in both the bracket bushing and the valve-stem bushing, and when the bracket is clamped in place, the reseating tool is well supported both above as well as below the cut. The result is a good seat which will require but a minimum of grinding.

An Accurate Grinding Fixture

BY H. F. FIEDLER

In Fig. 1 is shown a ratchet pawl that is used in sets of two, for the accurate feeding of paper in printing presses of the reciprocating type. The pawls have to stand hard usage, and when worn must be replaced by new ones that are required to be accurately ground on the two faces *O* and *P*.

The pawls are made of tool steel, hardened and tempered and then ground. A bar of steel about 14 in. long is machined to the shape wanted, and the pieces cut from it by sawing. After the pieces have been cut from the bar they are ground on the two flat sides to size, then drilled and reamed in a drill jig, there being enough left in the hole to allow for lapping after hardening. About 0.005 in. is left on the two surfaces *O* and *P* for grinding. The surface *P* must be ground to the angle 8 deg. 36 min. and to the dimension 1.237 in. ±0.001 from the center of the hole.

The grinding fixture shown in Fig. 2 consists mainly of the cast-iron piece *A*, against which the three pieces *G* are screwed and doweled. The pieces *C* and *D* are in turn screwed and doweled to pieces *G*. The pieces *G* are bored to receive the two plugs *F*, on each of which are located four pawls as shown by the dotted lines. The surface *O* on the pawls is ground first, the pawls being held in the position as shown at *H*, by the thumbscrew *E*, which holds them against the stop *X*. As shown, a saucer-shaped wheel is used for grinding.

In grinding the surface *P*, the pawls are swung over to the position as shown at *I*, the thumbscrew being changed over to the other side of the fixture and holds the pawls against the stop *Y*. Either the same wheel or a standard, ½-in. face wheel is used to grind the ends to the finish size, which will then be even with the top of the fixture. The accuracy can be tested by the simple use of a straight-edge.

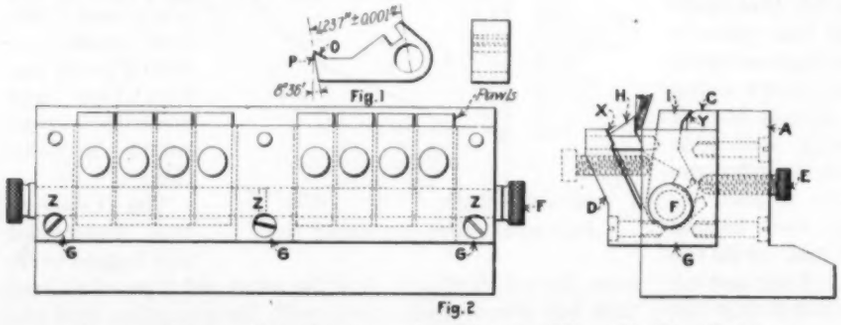


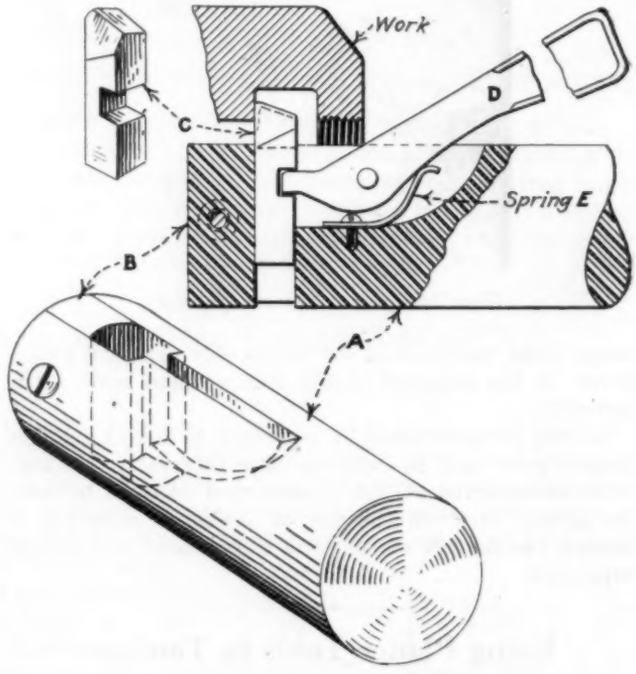
Fig. 1—The work to be ground. Fig. 2—The grinding fixture

Hand-Operated Facing Tool

BY C. W. FRANK

In machining a pump casting, it was necessary to face an inside surface and the tool illustrated was adopted, due to its simple design and the satisfactory results it rendered. The dimensions left by the cut were not required to be extremely accurate, since the purpose was merely to clean off the scale and provide a location for the assembling of additional parts. The operation was performed on a hand screw-machine, the attachment being fastened to the turret.

The body *A* is slotted at the cutting end to receive the filler block *B*, inserted so as to form a sliding fit for the facing tool *C*. Another slot, machined at the



Hand-operated facing tool

rear of the tool slot, forms a clearance for the operating lever *D*, pivoted on a pin in the body. In operation, the lever is pressed down so that the facing tool strikes the portion of the work to be machined, the exact location being determined by a turret stop. The spring *E* forces the lever upward and likewise returns the facing tool to such a position that it will not mar the other surface of the work when it is withdrawn. By carefully fitting the toolbit in the slot, so that rigidity will be maintained, it is possible to obtain long service from the tool before it is too short for further use. The tool can be made from a piece of high-speed steel that is too short for use in an ordinary toolholder. A device of this type can be applied on similar work and will afford a satisfactory method of facing an inside surface.

Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

Tolerances and Limits

Q. What is the difference between the term "tolerance" and the term "limit" in engineering practice.

A. The term "tolerance" is used in connection with the range of variation which may be allowed in the course of manufacture.

The term "limit" is taken as that point either larger or smaller than the nominal set dimension beyond which the work will not be acceptable.

For example a piece may be dimensioned two inches in diameter, ±0.005 in. The tolerance is then 0.010 in. while the two limits call for a minimum dimension of 1.995 in. and a maximum dimension of 2.005 inches.

Steam Hammer on Compressed Air

Q. Now that we have no further use for steam to heat our buildings we have only a steam hammer (1,500 lb.) on our 250-hp. boiler and we have difficulty in keeping a fire without blowing off, which is wasteful, aside from the cost of the attendants. We have three electrically-driven air compressors of 880, 700, and 400 cu.ft. capacity respectively. The 880 is in steady demand but the others are standbys. Could we use air to drive the hammer to advantage? The boiler and compressors are both operating at 100-lb. pressure.

A. It should be to your advantage to operate the hammer with compressed air which is not an uncommon practice, but as a check on the amount of saving to be expected you should balance the cost of producing steam against that for air on the basis that for each 100 lb. of falling weight of the hammer you will need 16 cu.ft. of air per minute. On your 1,500-lb. hammer this will amount to 16 × 15 or 240 cu.ft. total which the smaller of the three compressors can supply nicely.

Locate a fair-sized storage tank with a convenient drain as near the hammer as possible, as it is essential to best results, and pipe the hammer so the tank can remain in place permanently and have either steam or air available. Also, do not forget to change the oil to one correct for air as the heavy-body lubricant used with steam will not function properly with compressed air.

Drawing Steel

Q. How much would a ½-in. steel sheet be thinned in drawing into a 6-in. cup 4 in. deep.

A. The amount of uniform thinning that will be obtained is a function of the ductility of the steel and the design of the dies. Depending on the number of operations, which would determine how much of the material in the sides would be stressed each time, a sufficient number could stretch the metal to a probable maximum of one-half of its allowable unit reduction of area and result in a corresponding thinning without tearing. Decreasing the number of operations will reduce the possible figure. It is regrettable that there is so little available data on the subject but design of drawing dies and variations in the steel enter so many variables that the tabulated results of a given set of experiments would be but an indication at the best. As a result no definite figure can be named to fit the particular question.

If the edge over which the material draws is at all abrupt compared to the thickness of the steel and its corresponding resistance to bending, a local thinning may be expected in the side wall just above the break from the bottom. In the bottom itself there will be no appreciable change from the original thickness of the material.

From another standpoint the draw can be made if desired with practically no thinning in the side walls by so designing the dies, the trouble here being in the difficulty of keeping out the wrinkles that try to form as the material compresses in coming to the shape desired from the flat.

Size of Pulley on Motor

Q. We have a 75-hp. 1,200-r.p.m. motor driving an air compressor that is fitted with a 15-in. pulley. We desire to use this motor elsewhere and put a 75-hp. 900-r.p.m. motor in its place. This slower speed motor also has a 15-in. pulley which will have to be removed and a larger one, 20-in., put in its place, to keep up the required speed. We are wondering what effect the increased size of the pulley will have on the motor performance.

A. The size of the pulley has no effect on the horsepower of the motor as it will deliver the equivalent of 75 hp. at the rim regardless of the diameter. On the other hand the pounds of pull which a motor will make available at the rim is inversely affected by the size of the pulley.

One horsepower is the equivalent of 33,000 ft.-lb. per minute and assuming that the compressor demands just 75 hp. when loaded and neglecting belt losses, then

$$\frac{33{,}000 \times 75}{3.1416 \times 1{,}200 \times \frac{15}{12}} = 525 \text{ lb. pull at the pulley rim}$$

for the 1,200-r.p.m. motor and $\frac{33{,}000 \times 75}{3.1416 \times 900 \times \frac{20}{12}} =$ 525 lb. for the 900-r.p.m. motor which is seen to be the same.

The pull exerted by a motor or the torque of the motor is usually expressed in ft.lbs., at 1-ft. radius. It may be converted to horsepower when it is multiplied by the r.p.m. and by 2π, and divided by 33000. It is essential that a clear distinction be made between the two terms.

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Prices

EVERY so often we meet an individual who moans about the terrible cost of machinery and metal products and urges us to preach price reduction. We have never had any sympathy with this attitude because of our conviction that the prices of such products are too low rather than too high. The most recent Department of Labor indexes prove that we have good grounds for our opinion.

Based on 1913 as 100, the present index number for metals and metal products is 134, ten points lower than the 1924 figure. The index for all commodities is 161, eleven points higher than the figure of a year ago.

There is one other index number that equals the metals figure, that for chemicals, but it shows an increase of four points from 1924. The only figure lower is the one for miscellaneous items at 125, but this is an increase of twelve points over 1924.

Farm products have jumped from 137 to 161; building materials have dropped two points to 180; clothing is stationary at 191; and food has risen from 141 to 159.

In view of these figures, which are certainly unbiased, we can see no reason whatever for believing that prices on metal products and machinery are too high. As a matter of fact, they are distinctly out of line on the low side.

"Heads You Win—Tails I Lose"

THE old gambler's cynical philosophy is completely reversed for the foreign inventor by our existing patent laws. Under the "working" clause included in the patent laws of most other countries the inventor must manufacture the article he has patented within the country granting the patent before a certain period has elapsed. Otherwise his patent does not hold. Here we see one of the reasons for the foreign plants of such big American corporations as Singer, International Harvester and Worthington.

No such clause is present in our own patent laws and as a consequence a foreign company can secure patents here that effectually prevent the device patented from being produced in this country during the lifetime of the patent. In other words, the American inventor, or the company to which his patents are assigned, is not only discriminated against abroad but handicapped at home as well.

Three possible solutions present themselves. We must ask for agreements granting reciprocity to Americans in relieving them from the "working" clause in foreign countries; we must enact such a clause in our own laws to apply to aliens; or we must enact a working clause of our own to apply to aliens and citizens alike.

Either of the latter alternatives, and particularly the last one, is opposed to our basic ideas of patent protection. It is to be hoped, therefore, that our delegates who go to the Hague convention next fall will be successful in securing action from other countries granting relief of Americans from the operation of their respective "working" clauses.

Machine Tool Building in France

ON ANOTHER page we publish a list of the firms exhibiting machine tools at the recent industrial fair held in Paris. The interesting thing about the list is the large number of entirely French machine tools. The visitor at the fair who secured the information for us is authority for the statement that many of the tools shown were of excellent quality.

Here is a physical evidence of a change in the European machine tool situation. Before the war France was looked upon as a market for machine tools but as being relatively insignificant as a producer of them. The competition of French builders, even in France, was not looked upon as a very serious matter. But now the conditions have changed completely, at least so far as the simpler tools are concerned. The French buyer can get a machine, practically as good as an imported one, made by his own countrymen, and he can get it at a price very much less than that of the imported tool. The effect on imports of machine tools into France will be obvious.

The Courtesy of a Reply

WHEN you advertise for men to fill positions of more or less responsibility how much courtesy do you show toward those who take the trouble to answer your advertisement? Do you answer a favored few and ignore the others? If you do, how do you suppose they feel about it?

As a matter of fact, every man who answers that kind of an advertisement is entitled to some sort of a reply. Remember that even though you have no place for him now, you may want his services badly at some time in the future. Or, if you do not, some one similarly placed may.

The man who answers advertisements in good faith soon loses interest in them if he gets no acknowledgement of his reply. And when that happens the advertisement loses most of its value and the employer is cut off from a very excellent source of good men.

Shop Equipment News

Garrison Gear Grinder, Model B

Many improvements and distinctive features have been incorporated in the gear grinder, shown in the illustration, that has been developed by the Garrison Gear Grinder Co., Dayton, Ohio, and formerly described on page 366, Vol. 55 of the *American Machinist*. The machine is hydraulically controlled by motors and plungers, making its operation automatic.

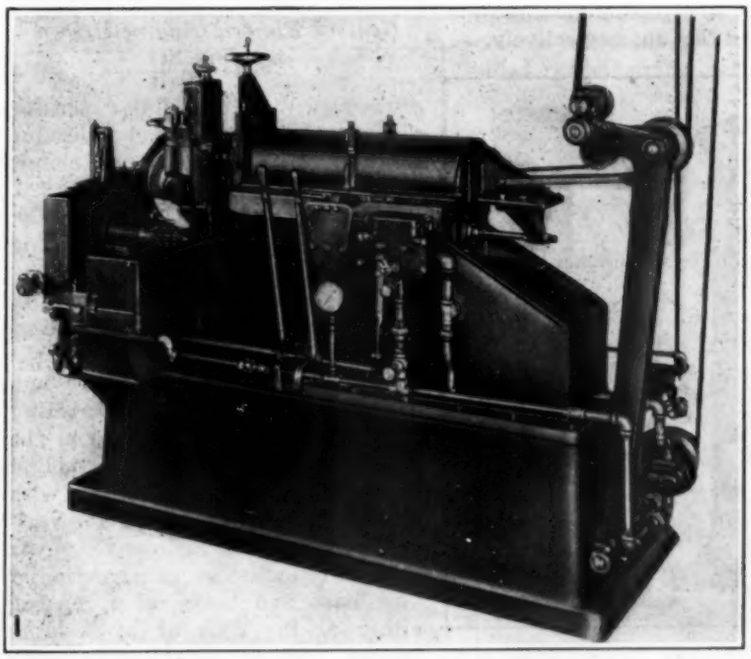
The abrasive wheel used has its periphery dressed to the size and shape of a rack tooth, that would mesh properly with a finished gear of a given pitch and pressure angle. By means of the hydraulically-operated ram, the formed wheel is traversed back and forth between the teeth of hardened gears, mounted on the arbor. The automatic traversing of the work table in either direction by a hydraulic motor across the path of the wheel causes the gears on the work-arbor to roll into engagement with the formed wheel in the same manner as the teeth of the master gear roll into engagement with a given tooth of the master rack. When the work has passed to the opposite side of the wheel, the master rack is lifted out of engagement by another hydraulic motor that has a reciprocating-rotary movement through an arc of approximately 270 deg. at each end of the table travel.

After the rack is disengaged, the rack arm engages and lifts the indexing link, bringing the pawl into engagement with the index ratchet and indexes the work one tooth. The last half of the motor travel brings the rack down, holding it in mesh with the master gear. At this position the work-table motor brings the work in engagement with the wheel, finishing the side of the next two adjacent teeth.

When the work has been indexed through one revolution, the machine is automatically stopped by the trip pawl on the inner end of the shaft carrying the ratchet wheel. The indexing and stopping mechanisms are at all times in relation to one another, both being operated by the same motor and similar ratchet wheels.

A wheel dresser is mounted on the head directly over the wheel, providing an adjustable means of dressing the wheel for finishing the gears, from 3- to 16-diametral pitch, of any pressure angle from 8 to 25 deg. The size of the wheel used is 10x½x3 in. The finishing of gears to a predetermined size is accomplished by setting the graduated collar to zero on both the wheelhead and the wheel-dresser, slide-traverse screws, after the first gear has been finished to the desired size. Dressing the wheel reduces its diameter and increases the distance between it and the work. To compensate for this, the wheelhead is lowered until the reading on its graduated collar coincides with the reading of the graduated collar on the wheel dresser.

The wheel is driven by a 2-in. belt direct from a countershaft, the belt passing over the pulleys on the automatic belt tightener through the ram to the wheel spindle, then back under the idler. Belt tightener and idler pulleys are mounted on swinging arms that are pivoted to the base of the machine. By this means all tendencies of the belt to lift or to cause vibration in the ram of the wheel spindle are transferred through



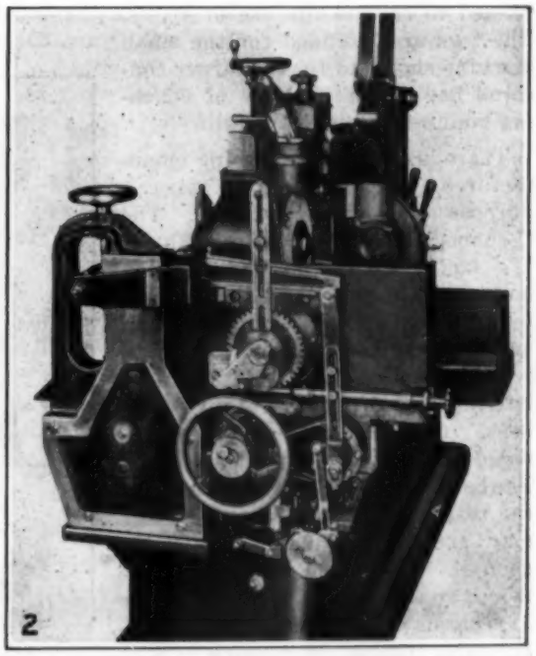


Fig. 1—Garrison Gear Grinder, Model B. Fig. 2—Indexing, generating and automatic-stopping mechanism

SHOP EQUIPMENT NEWS

the swinging arm to the base, where they are absorbed. A geared-type pump furnishes oil under pressure direct to the ram, indexing and table-traverse motors. Ordinary valves provide individual adjustment for the pressure or the speed of each motor. The oil furnished by pump, in excess of that required to operate the various motors, is automatically returned to the oil tank along with the exhaust oil. This pump is driven by a 1½-in. belt that also drives the centrifugal pump that furnishes a generous flow of coolant.

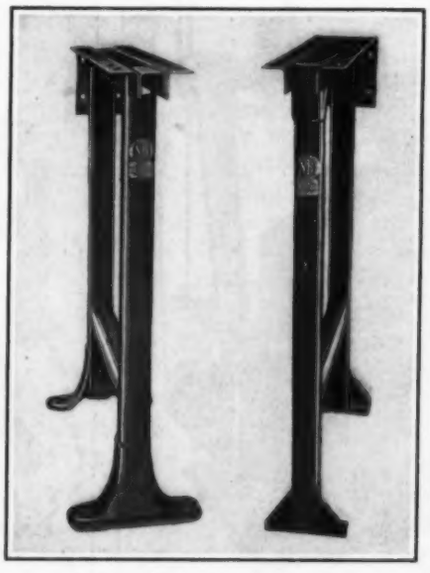
The ram has a maximum travel of 6⅜ in. and can be adjusted to 3½-in. travel. The shorter travel can be located at any point within the 6⅜-in. range, a point of particular advantage when finishing narrow-face gears integral with long hubs or shafts. The location and length of ram travel is controlled by adjusting dogs. A speed of 50 ft. per min. of the ram has been found most economical for average work. This is maintained regardless of the length of stroke without any adjustment, keeping the production of the machine to the maximum when finishing this type of gear, since the ram will make twice as many 1-in. strokes per min. as it would if the machine was set for a 2-in. stroke. A wide range of feeds is provided by turning a handwheel to the left against a stop to any degree of coarseness for roughing cuts, and turning to the right for a feed of any degree of fineness for finishing cuts. This change constitutes the only adjustment required after the machine is set up. Approximately 2 hp. is required to operate the machine from the countershaft through the belts. The machine can be equipped for motor drive throughout if required. For the installation of a number of machines, both the coolant and the oil under pressure can be supplied from a central station through pipes direct to each machine, in which case the motor required on each machine would be only of sufficient size to drive the wheel.

New Britain Pressed-Steel Bench Legs

With many years' experience in the manufacture of cast-iron bench legs, the New Britain Machine Co., New Britain, Conn., has made a reproduction of these legs in pressed-steel form. This type of leg is built up of formed sections, electrically welded to obviate the use of rivets. The legs are intended for the small machine shop and for the larger concerns having installations of benching running into great length.

There are three styles being manufactured, the light-duty, general-purpose and heavy-duty types. The U-shaped section of the legs, with the U's facing each other, enables the underneath shelving and bin supports to be put in between the flanges and securely retained in place. The feet, or floor supports, have a suitable floor bearing and are shaped to give stiffness. Cleaning facilities are provided as an aid for shop sanitation. The backboard bracket that overhangs the rear upright member of the legs may extend over heating pipes if desired. The finished bench may be moved to any desired location, either in sections or as a unit, without considerable trouble. A distance of 8 ft. is the usual interval for the spacing of the legs, making them satisfactory for individual benches set at right angles to a wall.

The light-duty legs are made in 14 and 21 in. widths, this being the normal depth of ordinary benches. the weights are 9¼ and 16¼ lb. and the depths with the angle brackets are 20½ and 26½ in. respectively.



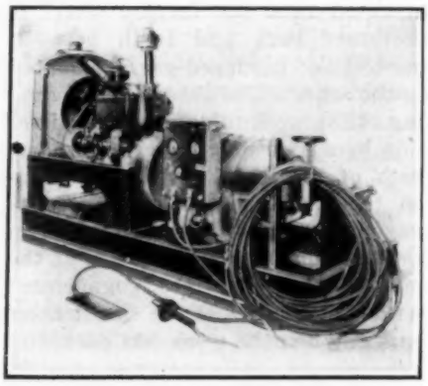
New Britain Pressed-Steel Bench Legs

The general-purpose legs are made in single and double types, the widths are 23 and 30 in., the weights are 16½ and 22½ lbs. and the depths of bench are 29 and 30½ in. respectively.

All the legs are 31¼ in. high. It is claimed that they retain the stiffness and rigidity of the cast-iron style, but with the elimination of excessive weight and the liability of breaking under service. Additional stiffness is added by the backboard bolted to the face of the bracket at the rear that forms a screen to prevent work from being pushed off the bench.

General Electric Engine-Driven Welding Set

The engine-driven welding set shown has been added to the line of welding equipment manufactured by the General Electric Co., Schenectady, N. Y. The unit consists of



General Electric Engine-Driven Welding Set

a standard WD-12 welding generator that is driven by a Buda gasoline engine instead of an electric motor, as previously described on page 829, Vol. 60 of the *American Machinist*. Wooden skids are used for mounting to facilitate moving.

The engine, a Buda model WTU, designed for heavy duty, is a four-cylinder, four-cycle motor of the L-head type, with 3¾-in. bore and 5½-in. stroke. The S. A. E. rating is 22.5 hp., and at 1,400 r.p.m. the actual brake hp. is 33. The welding device, being marketed complete with all accessories, is intended for various uses such as locomotive repair work at roundhouses, construction of pipe lines and tanks, ship repairs, either at the dock or by welding barges, and on construction work where electric power is not available.

SHOP EQUIPMENT NEWS

Montgomery Lathe and Planer Tools

The Montgomery Tool & Machinery Co., 139 Main St., Woonsocket, R. I., is marketing a line of straight and angular toolholders for the lathe, shaper, turret and boring machine, adjustable holders for the planer, in which the cutting bit may be set at any desired angle, and a double-lip boring tool.

Of the lathe tools, those shown in Fig. 1 represent the straight bit and the right and left-hand angular bits. In the first, the bit is of square section and is intended for regular service wherein an operator desires to grind the cutting lip to suit the work

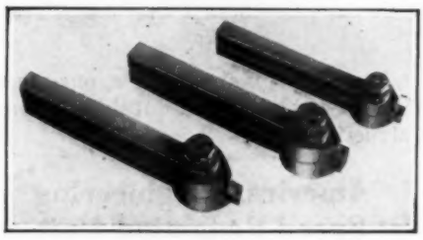


Fig. 1—Straight and Angular Lathe Tools

in hand. The angular tools have bits of trapezoidal section, giving a fixed top rake of 12 deg. and a side clearance of 6 deg., right and left hand respectively; so that for straight turning in either direction the bit need be ground for resharpening on

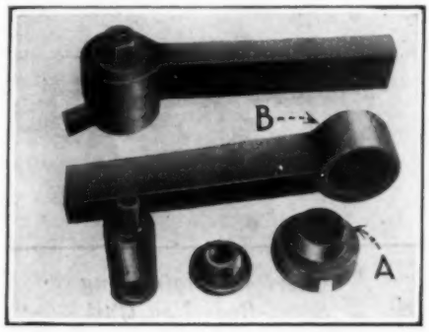


Fig. 2—Adjustable Planer Tool

the end only. The shanks of the tools are drop-forged of alloy steel in two parts and a groove is milled throughout the length of each to match the bit. The clamping bolt is large in dameter and is made like the toolpost of a lathe with a clearance opening through which the bit passes. This method of clamping distributes the strain evenly over a considerable portion of the bit and it is claimed by the makers that breakage of high-speed and stellite bits by reason of concentrated clamping pressure is obviated. Another advantage claimed is that as bits of any desired length may be used the

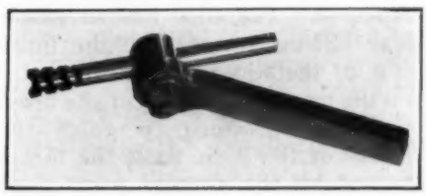


Fig. 3—Double Helical-Fluted Boring Tool

wastage due to the use of short bits is practically greatly reduced.

The adjustable planer tool, shown assembled and in detail in Fig. 2, has a swivelling collar *A* that fits into the opening of the shank *B*, each part being serrated upon the mating surfaces. The bit rests partly in the rectangular slot in the underface of the collar *A*, so that when the parts are clamped together by tightening the single nut of the binding bolt the serrations of parts *A* and *B* are drawn together, making the tool practically immovable. By loosening the nut, part *A* and the bit may be turned to any angle around a complete circle.

The boring tool, Fig. 3, consists of a double-lip fluted bit which enables the operator to make two grinds for resharpening at each resetting of the tool. When the first lip has become dulled the clamping nut is loosened and the bit rotated one-half turn, thus bringing the other lip into position for service. The clamping device is similar to that employed in the planer tool and permits the bar to be levelled without regard to the angle to which the shank may be tilted.

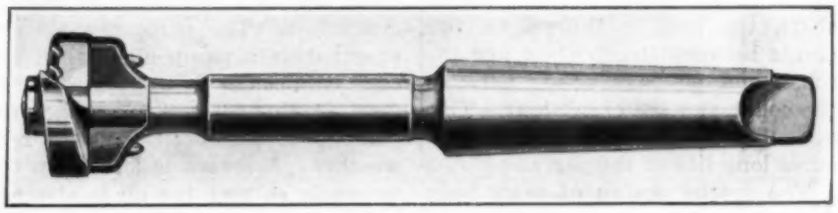
All of the tools are made in three standard sizes of shank. All parts are of alloy steel and are pack-hardened. The special sizes and shapes of cutting bits may be obtained readily from the makers.

Wisabo Rapid-Boring Knives

The boring knives illustrated have been marketed by the Wisabo Rapid Drill Co., 200 West Monroe St., Chicago, Ill., and are manufactured in Berlin, Germany. These tools, intended for boring surfaces, are used on boring machines, turret lathes and similar machines that perform boring operations.

The spiral boring knife, made of high-speed steel, is in the form of a disk, with two cutting edges facing each other radially. In order to obtain an advantageous cutting position and to avoid unnecessary friction, the back edges, as well as the surfaces, are backed off from the cutting edges. The surfaces facing the holder are spiral in order to keep the face of the tool low and to favor the detachment of cuttings. The knives have a bevel cutting edge, but can be obtained with a straight edge and a cutting angle of 65 deg. and with grooves for chip breakers.

The holders for the knives are supplied in two forms, a short and a normal one, provided with Morse shanks. The normal sizes are made so that the length of the holder, with the boring knives attached, corresponds with the length of a standard twist drill of equal diameter. The short forms are used when a short, stout tool is desirable. The knives, made in diameters from 1½ to 6 in., are divided into eight groups. For each group, only one holder is necessary, as the knives of a group are interchangeable and several can be attached to the holder. The holder, driving-plate pins, guide bolts, pilots, closing plates and set screws are made of a good grade of steel, hardened and polished on the surfaces. The knives are made in ½-in. sizes, but may be obtained in ¼-in. sizes on special order. For deep boring, special holders with a built-in coolant passage are necessary.



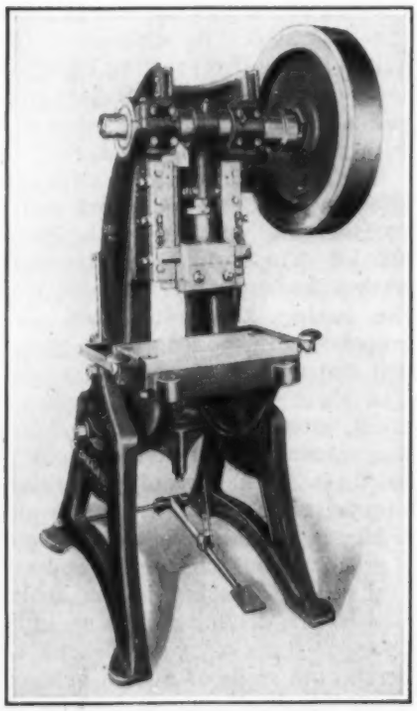
Wisabo Rapid-Boring Knives

SHOP EQUIPMENT NEWS

La Salle "Verson" Inclinable Punch Press, No. 3-OBI

The "Verson" inclinable punch press illustrated has been added to the line of machines manufactured by the La Salle Machine Works, 3015 La Salle St., Chicago, Ill. Accuracy, safety, ease of operation and long life are the outstanding features claimed.

A non-repeat safety clutch that has no sliding clutch pins or keys is provided. The jawed clutch collar itself moves over a 3¼-in. squared portion of the crankshaft directly into the hub of the flywheel, where it remains until the revolution is completed. It is released by the direct action of the 1½-in. square release arm, so only one revolution



La Salle "Verson" Inclinable Punch Press, No. 3-OBI

is possible. A heavy clutch spring is located between the clutch collar and the crank-shaft and, as the jawed clutch slides on the squared shaft, the load is thrown on two points between the flywheel and the collar and on four points between the collar and the crankshaft. This action distributes the load and insures long life of the parts.

The special design of press body makes possible the machining of both the bed and the slideways at one setting, so that accuracy and substantial adjustment of gibs are rendered. The slide has an extra-long sliding surface and the inner side of the slideways bears directly on the machined surface of the body. Gibs are provided to guide the stroke of the slide, while the thrust caused by the angular position of the connecting rod is taken directly on the body of the press.

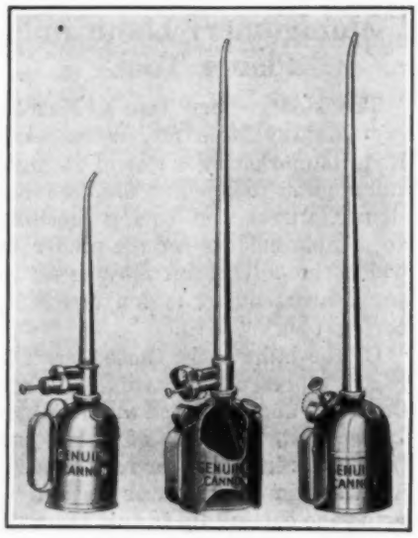
The ball and socket connection between the slide and connecting rod is provided with an adjusting nut so that only a fraction of a turn is necessary to take up any wear that may accumulate. The inclining attachment is operated with an 8-in. handwheel, conveniently located.

The capacity of the press is approximately 20 tons, the standard stroke of the slide 2 in., the maximum stroke 4 in. and the adjustment 2½ in. The area on the top of the bolster is 21x12½ in. and the thickness is 1½ in. An oblong opening, 6x9 in., is provided in the bed. The speed of the flywheel is 100 r.p.m., its diameter being 28 in. with a 4½-in. face. The weight is 2,200 pounds.

Cannon Combine Pump and Pour Oiler

The combination pour oiler illustrated, manufactured by the Cannon Oiler Co., Keithsburg, Ill., and recently placed on the market, incorporates features of the pump oiler made by the company.

It is provided with a separate channel, under control of the finger ring, so that oil can be poured out in a steady stream if desired. The control is outside of the can so that it can be easily operated or adjusted. The pouring device is valuable for filling large oil cups and is easily controlled by a movement of the index finger. The pump can also be operated as a pump oiler when the can is upside down. The large straight channel will allow the free passage of heavy oil, even in zero weather. A screen is located in the reservoir so that the oil is strained before it passes out the spout. The

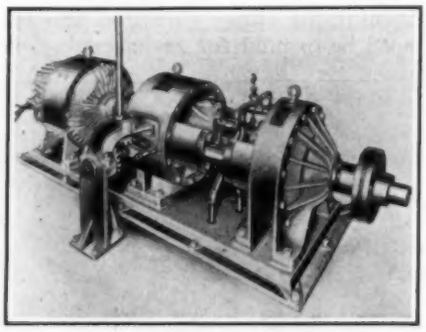


Cannon Combine Pump and Pour Oiler

oiler, built of steel and a one-piece drawn-steel shell, is durable in construction.

American Engineering Speed-Reduction Unit

The American Engineering Co., Philadelphia, Pa., has added the speed reduction unit illustrated to its present line of machinery. The device is intended for a variety of machine-tool drives, including presses, broaching machines, planers,



American Engineering Speed-Reduction Unit

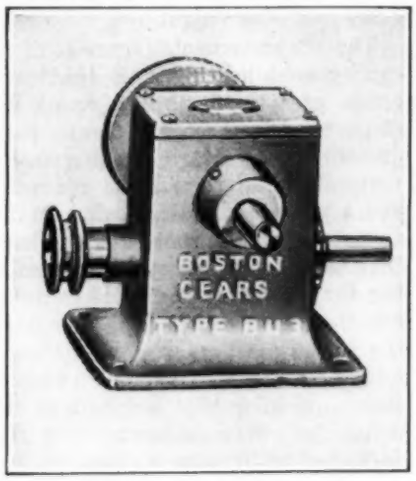
testing machines, cranes, mechanical stokers and similar equipment.

A Hele-Shaw hydraulic pump and hydraulic motor are used as a speed reduction unit in place of the usual nest of gears. The elimination of gears has reduced friction and aids to the available ratio range of the device. It is possible to obtain various reduction ratios, up to 850 to 1, without stopping the direct-connected electric motor.

SHOP EQUIPMENT NEWS

Boston Gear Works Speed-Reduction Unit, Type BU3

The Boston Gear Works Sales Co., Norfolk Downs, Mass., has marketed the speed-reduction unit, type BU3, shown herewith. It is constructed for light drive, such as used for display apparatus, and may be mounted on a base with a suitable motor.



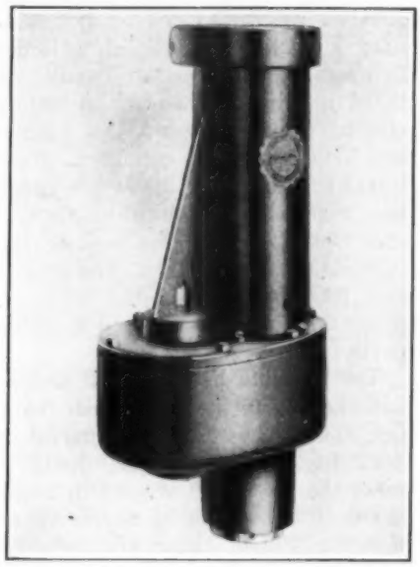
Boston Gear Works Speed-Reduction Unit, Type BU3

The drive shaft is fitted with a 1½-in. diameter grooved pulley, suitable for a ⅜-in. round belt. The driven shaft has a similar pulley 3 in. in diameter. By attaching pulleys of various sizes, various speed ratios are obtainable. The double projections of the driver and the driven shafts provide opportunities for additional connections. The height of the worm shaft from the base is 2 in. and the center distance of the driver and the driven shaft is 1.333 in. Under proper conditions this unit will transmit from ⅛ to ½ hp. at varying speeds. An oil reservoir is provided to insure proper lubrication of the gears. The gears may be examined at any time by lifting the upper cover. One of the features claimed for the unit is that it requires only a small space and may be easily mounted.

Hoefer Heavy-Duty Drill Speeder

The drill speeder illustrated has been added to the line of drilling equipment manufactured by the Hoefer Manufacturing Co., Freeport, Ill. It is intended for use on radial-drilling machines, providing proper speeds for drills smaller than can be efficiently operated on such machines, effecting a saving in wear.

The speeder consists of a housing that has a nose and a driver to fit the particular machine on which it is to be used. It can be equipped with either a No. 4, 5 or 6 Morse taper shank, assuring sufficient range beyond its requirements with a capacity of 1¼ in. Gears 2 in. in width with 6-8 pitch stub-form tooth, made integral with the spindles, are used.



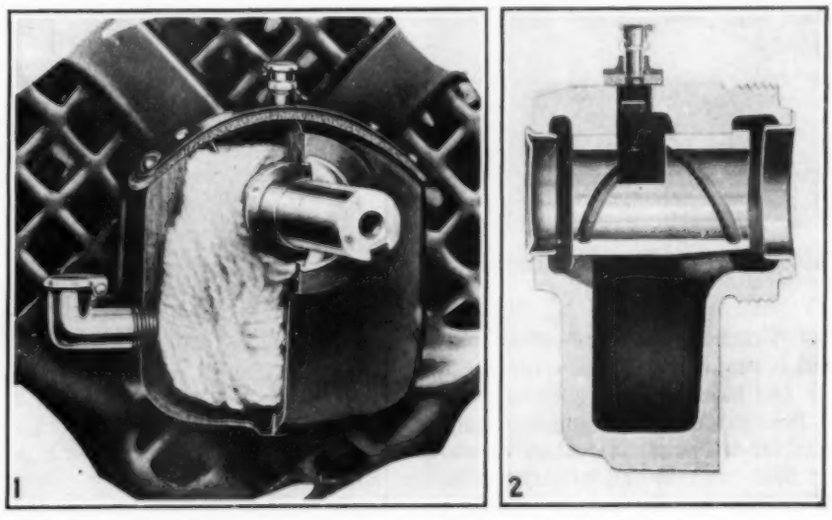
Hoefer Heavy-Duty Drill Speeder

Roller bearings, used on all the spindle bearings and to take end thrust, reduce the friction and insure operation with the least amount of power. The unit is rigid in construction and is compact, measuring less than 12 in. through its cross-section.

Century Lubrication System for Small Motors

The wool-yarn system of lubrication for fractional h.p. motors, illustrated here, has been placed on the market by the Century Electric Company, St. Louis, Mo. The system consists of continuous strands of wool packed into an oil well so that a direct contact with the surface of the armature shaft is obtained.

A constant pressure of the wool yarn with the shaft is assured by a spring attached to the underside of the oil-well cover, so arranged that it exerts a downward pressure against the wool. In addition to the oil held in suspension by the yarn, there is an additional supply in the oil well. The strands of wool yarn are continuous so that capillary attraction is assured and the lubricant is continuously delivered to the shaft with the result that the shaft "rides" against a fully saturated bundle of wool-yarn strands. The capillary action gives a new supply of oil continuously and consequently all the oil is being filtered by passing through the yarn fiber. It is claimed that this system eliminates oil bubbling and the possibility of clogging up the oil returns to the oil well, also that it assures proper lubrication under all conditions, even at low temperatures. The use of cotton or wool waste in these bearings is not recommended as the value of capillary action is practically nullified. A good grade of mineral oil of medium viscosity is a satisfactory lubricant.

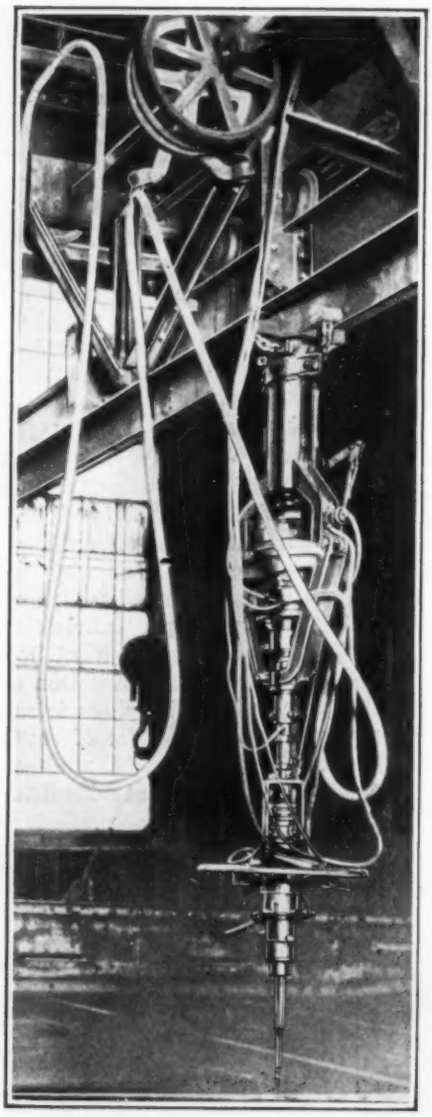


Century Lubrication System for Small Motors

SHOP EQUIPMENT NEWS

American Car & Foundry Reaming Machine

The reaming machine illustrated, manufactured by the American Car & Foundry Co., 165 Broadway, New York, N. Y., is intended primarily for use on freight- and passenger-car work such as general assembly, sub-assemblies, truck and body bolsters, car sides and similar units, but is also adaptable for work that



American Car & Foundry Reaming Machine

has punched holes in steel parts which require reaming after assembly and before riveting.

The machine is mounted on a traveler that can be racked forward or backward by an electric motor, controlled from a switch located on the handwheel. The longitudinal spacing of holes is limited only by the length of the traveler runway. The trolley that carries the machine has been provided with ball bearings so that a light push on the handwheel will give horizontal control along the traveler bridge. The electric motor used for rotating the reamer has a break-test capacity of 6.9 hp. and the unit will ream holes up to 1⅛ in. in diameter. Rotation of the armature is controlled by a contactor that is operated automatically when the air cylinder, used for vertical control, is lowered or raised. The air valve used for controlling the air cylinder is operated by a clamp handle, located on the handwheel. A safety clutch, placed between the reamer and armature-shaft extension, is released as soon as the operator's hands are removed from the handwheel, and when released the reamer immediately stops rotating. The reamer and its extension, if the latter is used, are the only exposed rotating parts.

The machine has sufficient weight and rigidity to insure vertical reaming, and yet has a certain amount of flexibility, permitting the tools to enter the holes that are not in alignment. It is claimed by the company that the use of these machines results in direct saving in the cost of reaming holes, as well as an increase in production, and that it is not unusual for one man to ream from 500 to 900 holes per hour on work of an average character.

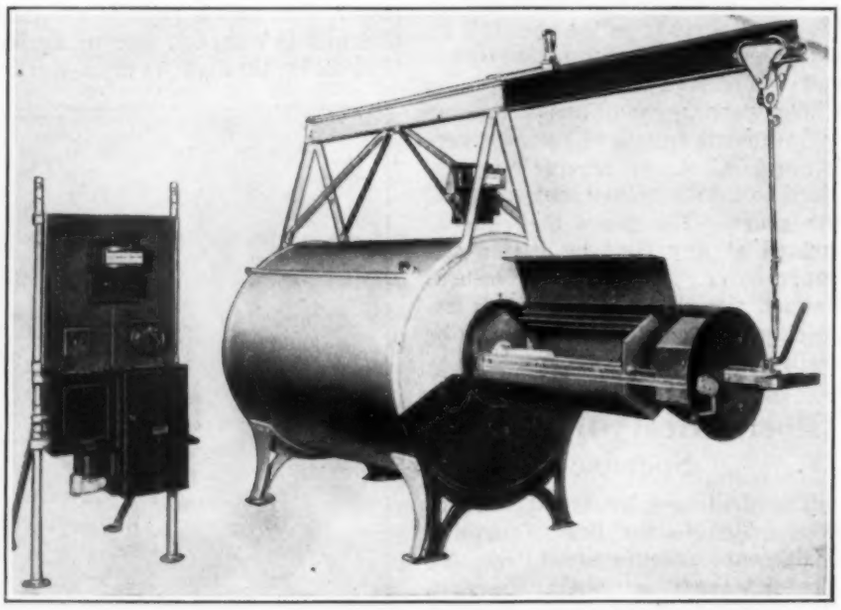
Eaton Improved Electric Heat-Treating Furnace

The Eaton Electric Furnace Co., of Taunton, Mass., has brought out an improved type of its Model R, rotary, electric, heat-treating furnace for handling work that does not require a temperature to exceed 1,250 deg. Fahrenheit.

The improvements consist of a spool-wound heating unit that provides greater flexibility than the older type and at the same time preserves the feature of being easily removable for repairs or renewal; and a container that remains in the furnace and thus conserves the heat that was formerly expanded in raising the temperature of cold containers that had been reloaded outside the furnace.

The container is made of a nickel-chromium alloy that resists heat indefinitely. It is so mounted in the furnace that it may be run out for dumping and reloading without seriously lowering the heat of the chamber. The weight of the outer end of the container is supported when run out by the trolley that is suspended from the overhead I-beam.

To dump and reload the container it is withdrawn to the position shown in the accompanying illustration, the cover unlatched, and the container allowed to continue its rotative motion until the cover is at the bottom, when it opens and discharges the work into a box placed to receive it.



Eaton Improved Electric Heat-Treating Furnace

SHOP EQUIPMENT NEWS

The container is then revolved until the cover is at the top, where it is stopped to be reloaded.

A double temperature control is also provided. The hot end of one thermo-couple is permanently placed in the heating chamber and connected with the instrument on the control panel. This may be any one of the standard types of electric recording or indicating pyrometers.

A second thermo-couple is so placed in the furnace that when the container is shoved back into position the hot end of the couple enters a perforated tube extending axially toward the center of the container. This tube may plainly be seen in the illustration.

The second couple is connected to another instrument that may be arranged to light a lamp, ring a bell, or otherwise inform the operator that the maximum temperature required by the charge has been reached.

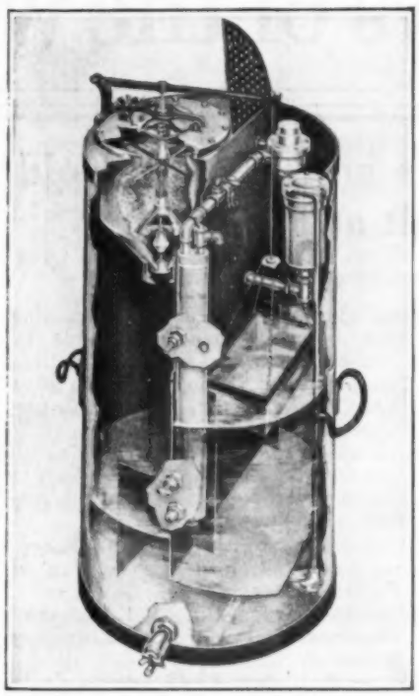
The furnace is made in two sizes: one with a container 12 in. in diameter by 18 in. long, to contain a charge of 125 lb.; and the other with a container 14x36 in., to hold 300 lb. of work at each charge.

Oxweld Portable Low-Pressure Acetylene Generator

The small generator illustrated has been marketed by the Oxweld Acetylene Co., 30 East 42nd St., New York, N. Y., to supplement a line of larger generators now used by shops where cutting and welding is accomplished.

The generator, that takes 35 lb. of carbide at one charge, can be transported readily from place to place, providing a portable supply of generated acetylene gas. The weight of the generator empty is 210 lb. The principle of the feed control used might be called a "heavier-than-water" float. A vertical partition, extending nearly to the bottom into a small seal, divides the generator shell, and on one side is a gastight compartment that contains the carbide hopper at the top, while the upper part of the other side contains the gas-regulating and protective devices and an automatic carbide-feed control.

Generation of the first acetylene causes the water to rise, on the last mentioned side, high enough to all



Oxweld Portable Low-Pressure Acetylene Generator

but submerge a full pan of water hung to a control lever. The pan normally acts as a weight, acting counter to a spring, but as the water rises about it, its weight is diminished and the carbide hopper valve is closed by the action of the spring.

As acetylene is drawn off, the water rises in the gas compartment and correspondingly lowers the float, relieves some of the buoyancy under the water pan that, gathering weight with the receding water, depresses the spring and allows a small amount of carbide to drop into the generator and restore equilibrium conditions.

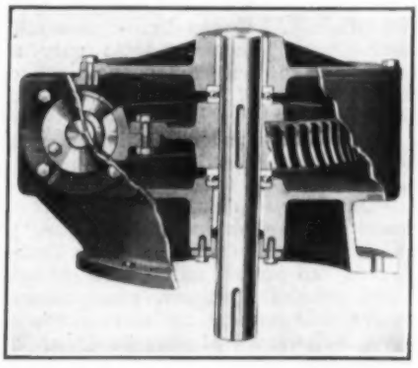
Because of its low center of gravity, the generator rights itself when tilted at an angle of 30 deg., and can work satisfactorily at an inclination of upwards of 10 deg. No adverse effects result if a generator while in operation is knocked over. Nearly all the fittings are inclosed in the cylindrical shell, so that a fall on a concrete pavement would not be apt to injure the unit.

Two handles are located on the outside of the tank for transportation purposes. The valve for draining the water from the unit is located in the lower portion of the body, so that the inside may be cleaned and refilled with water.

Foote Bros. Vertical Wormgear Speed Reducers

The Foote Bros. Gear & Machine Co., 215 N. Curtis St., Chicago, Ill., has added to its present line of gear products a vertical speed reducer. The construction of the reducer is similar to the standard type made by the company, embodying a cast-iron case with a removable top. It is designed to be set on its side with the driving shaft at the right, the wormgear revolving in a horizontal plane and the slow-speed shaft in a vertical position. This shaft can be extended upward or downward as the conditions may require, so that the reducer can be located under or above the machine to be driven.

Removable end plugs with oil-tight stuffing glands are provided at each end of the worm. The base is cast integral with the case to provide mounting either on the floor or from the ceiling. The worm, made of an alloy steel, has large ball-thrust bearings at both ends. The wormgear can be furnished of semi-steel or of bronze with a cast-iron center



Foote Bros. Vertical Wormgear Speed Reducers

as desired. The wormgear shaft rotates in special phosphor bearings and the ball-thrust bearings are provided at each end of the shaft to take up any upward or downward stroke that may be encountered in operation. It is claimed that the unit is practically noiseless, that it eliminates power losses and conserves space due to its compact design. It is made in a variety of sizes and ratios, ranging in capacity from fractional hp. up to 100 hp. with reduction ratios from 7 to 1 up to 120 to 1. The unit is suitable for various forms of industrial machinery.

News of the Week

Machine Tool Builders and Dealers Hold Impressive Exhibit at Paris Fair

Specialization not yet the policy of French builders

An unprecedentedly large number of French machine tools were shown at the 17th Paris Fair that closed recently. Not only were there many tools but many exhibitors. It was evident that specialization has not yet become the policy of French machine tool builders, as a large proportion of the exhibitors showed very extensive lines. How extensive will be seen in the following list.

America machine tools were shown at the exhibits of Burton Fils, Fenwick Frères et Cie. and Aux Forges de Vulcain. Burton Fils showed Wilmarth & Morman grinders and Land-matic die heads in addition to their own line of sensitive drills. Fenwick Frères et Cie. exhibited Brown & Sharpe machines and Reed-Prentiss lathes, also Ingle gear tooth rounding machines. Aux Forges de Vulcain exhibited Cincinnati milling machines and Cincinnati shapers together with Blau and Co. drilling machines and tool grinders, and Pax lathes. As it was decided to admit other than French products only a month before the Fair opened, other representatives of American firms were unable to arrange exhibits.

A list of the firms exhibiting French machine tools follows:

S. A. O. C. M. — (Société Ardennaise D'Outillage et de Constructions Mécaniques), Mézières (Ardennes); Drilling machines, lathes, power hacksaws, universal milling machines, tool grinders, planers, power hammers, belt sanders, toolroom slotters.

Phoenix-Nouveau, 31 Rue de Phoenix, Gand, Belgium;
Boring mills.

Ateliers G. S. P.—(Guillemin-Sergot & Pegard), 55 Boulevard de la Vilette, Paris;
Planers, lathes, shapers, vertical drilling machines, radial drills, slotting machines.

Ernest Cornac, 17 Rue du Faubourg-Montmarte, Paris;
Horizontal boring machines, shears and presses.

Société Alsacienne de Constructions Mécaniques, 32 rue de Lisbonne, Paris;
Lathes, planers, slotting machines, shapers, drilling machines, boring mills, milling machines, grinders.

H. O. Bourdouxhe, Agent for Machine Tools, 158 avenue Parmentier, Paris;
Screw machines, portable electric drills, punches, power hacksaws, multiple-spindle drills, hand milling machines, automatic milling machines, universal milling machines, automobile cylinder boring machines. (Threading and broaching machines made by Maison Cornelis, Liège, and milling machines and drilling machines made by Ateliers Jasper, Liège, Belgium, were shown at this exhibit.)

Sculfort-Fockedey, Vautier & Co., 13 rue du Progress, Maubeuge (Nord); Lathes, vertical lathes, boring machines, planers, shapers.

Établissements J. J. Carnaud & Forges de Basse-Indre, 37 rue de Surène, Paris; Shears, presses.

Thomson-Houston Cie., 173 boulevard Haussmann, Paris; Small drilling machines.

Mestre & Blatge, 46-48 avenue de la Grande-Armée, Paris; Sensitive drills, portable electric drills, lathes, woodworking machinery.

G. A. Guyot, 122 avenue de la République, Paris; Lathes, milling machines, automatic shears, drilling machines, screw machines.

Gambin & Cie., 128 rue du Point-du Jour, Billancourt (Seine); Universal millers, shapers, milling machine attachments.

Société Anonyme des Établissements Le Jeune et H. Michel-Levy, 91 bis Rue d'Angoulême, Paris; Automatic gear cutting machinery, drilling machines.

Société Anonyme des Anciens Établissements Cuttat & Co., 53 rue Servan, Paris; Lathes, screw machines, milling machines, threading machine.

E. J. Conill, 9-11 rue Neuve de Villiers, 9-11 Le Vallois-Perret (Seine); Turret lathes, power hacksaws.

Gustave Carpentier et Fils, 40 quai de Jemmapes, Paris; Embossing presses, dies.

Georges Brunet, 8-17 rue des Fontaines, Paris; Presses, small shears.

Auguste et des Moutis, office, 5-7 Impasse de l'Ouest, Courbevoie (Seine); Gear cutting machinery and fixtures for lathes.

H. Pinsmaill, 1 rue de Metz, Paris;
Air compressors and pneumatic machinery, polishing machinery. (Boring mills of Soc. An. de Phoenix-Nouveau of Gand, Belgium, were shown here.)

O. Podhajsky (Czecho-Slovakia), Paris office, 24 avenue du Bel-Air;
Radial drills, turret lathes, grinders screw machines, planers, bolt threading machines.

Association des Constructeurs du Nord et de l'Est, 6 impasse de l'Orillon, Paris;
Shears, presses, drilling machines, bench tools, arbor presses.

Établissement H. Sudry, rue Beauséjour prolongée, Nantes;
Shears, presses.

Schaublin Villeneuve, Mallerey, Suisse (Switzerland), Agent—G. A. Guyot, 122 avenue de la République, Paris;
Precision lathes.

Établissement Richert-Laval, Besançon, 50 rue St. Lazare, Paris;
Power presses.

Atelier Vilar, 185 rue du Vieux-Pont de Sèvres, Billancourt (Seine);
Drilling machines.

S.O.M.U.A.—(Société d'Outillage Mécanique et d'Usinage d'Artillerie), 146 boulevard Victor-Hugo, Paris;
Hydraulic press and machinery, milling machines, lathes.

P. Hure & Co., 218 rue La Fayette, Paris;
Universal, vertical and horizontal millers, shapers, lathes, attachments, cutter grinders.

H. Ernault, 169 rue D'Alésia, Paris;
Lathes, milling machines, boring machines, gear cutting machines.

Établissements Breguet Frères, at Thonon les Bains, (Haute Savoie);
Swaging machines.

Émile Guinot, 34 Square Clignancourt, Paris;
Hand and power press.

Ateliers Mécaniques de Saint-Eloy, 92 avenue de République, Paris;
Drilling machines.

Maison Wermelinger, 12 rue de Laitières at Vincennes (Seine);
Lathes, speed reducers.

George Groslambert, 23 rue de Vesoul, Besançon (Doubs);
Lathes, swaging machines.

Burton Fils, 68 rue des Marais, Paris;
Taps and dies, automatic chucks, single- and multiple-spindle drills, power hacksaws and power hammers.

Ateliers Jaspar, 2 rue Jonfesse, Liège, Belgium;
Universal millers, boring tools.

Boîche & Cie., 51 rue d'Arras, Lille (Nord);
Woodworking machinery, machine tools.

Société Française des Établissements Comhaire, 74 rue de la Folie, Mericourt, Paris;
Polishing machinery, planers, shapers, milling machines.

Achard & Co., 146 rue Oberkampf, Paris;
Sheet-metal working machinery, presses, electric welding machinery.

Affûteuses Marmon, 16 place des Vosges, Paris;
Sharpening machinery, band saws.

Agence Européenne de Machines-Outils, 28 boulevard Bineau, 28 Levallois, Perret (Seine);
Polishing machinery, lathes, drilling machines.

Anciens Établissements Salmon, 96 rue Amelot, Paris;

Shears, horizontal and power hacksaws, planers.
(Shapers, lathes, drilling machines, power hacksaws, radial drills, planers, presses and shears of L'Abeille at Louvroil (Nord) were exhibited here.)

Anciens Établissements Thoré, Bilard, Verron & Cie., 8 rue Clairant, Paris;
Lathes, power hacksaws.

Ateliers Précis, 229 boulevard Saint-Denis, Courbevoie (Seine);
Lathes and small machine tools.

G. & M. Bombled, 94 rue de Montreuil, Paris;
Sheet-metal working machinery, straight and rotary shears.

G. Brian & A. Sondée, 41 rue de Joinville, Paris;
Pumps and sheet-metal working machinery.

Maurice Claude & Cie., 24 quai de Boulogne (Boulogne-sur-Seine);
Small machine tools.

Comptoir General d'Usines, E. F. Michon & Cie., 46 rue de la Bien Faisance, Paris;
Power hacksaws.

Curial (Nouvelle Société) 190 avenue de Pontoise, Épinay-sur-Seine (Seine);
Cutting tools, saws.

Émile Debette, 235 avenue Gambetta, Bagnolet (Seine);
Stamping and embossing tools.

H. Ernault Ateliers, 169 rue D'Alesia, Paris;
Lathes, boring tools, milling machines.

Établissements Fernand Durand, 20 rue Saint-Fargean, Paris;
Light tools, precision instruments.

Établissements Esperia — (J. Pandavoine & L. Herregods), 159 avenue Gambetta, Paris;
Shapers, metal saws, planers.

Établissements Force, Chevrenay & Roux, 38 rue de Panoyaux, Paris;
Stamping, cutting, trimming and embossing tools.

Établissements Pahl, 11 rue Bernouilli, Paris;
Electric tools, drills and polishers.

Établissements du Val d'Or, 49 rue du Mont-Valerien St. Cloud (Seine-et-Oise);
Machinery for drawing pipes and tubes, drills, polishing turrets.

A. Cazagnaire, 24 avenue du Bel Air, Paris;
Sheet metal working machinery.

Georges Hody, at Vrigne-aux-bois (Ardennes);
Heavy presses, multiple punches.

A. Hubert, 97 avenue du Général-Michel Bijot, Paris;
Presses for trimming and embossing, machines for sheet-metal working.

H. Lapipe & Ch. Wittman, 39 rue Saint Fargeau, Paris;
Tools for trimming, stamping and embossing, shears.

Lefebure & Geny, 55 rue de Croy, Amiens (Somme);
Lathes, shapers, and boring tools, sheet-metal working machinery.

Mach & Fiser, at Hronov-Mad-Met, Czecho-Slovakia;
Sheet-metal working machinery, shears, grinders, rolling machines.

Société Anonyme Marqcol, 125 des Garceaux, Moulins (Allier);
Circular, band and table saws.

Paul Godneir, Matériel Électrique & Mécanique, 1 passage Haguette, Saint-Denis (Seine);
Electric drills.

M. & R. Pinchart-Deny Frères, 58 rue Saint Sabin, Paris;
Stamping, and trimming presses, sheet-metal working machinery.

E. Pouchon, 7 rue Jean-Macé, Suresnes (Seine);
Bandsaws, circular saws, drilling machines, polishing spindles, punches, mortising tools.

Riollet-Dufour, 46 rue Lafayette, Paris;
Machine tools and hoisting machinery.

La Soma, 17 rue Brey, Paris;
Drilling machines, saws.

S.F.O.P. — (Société Française de Machines-Outils de Précision), at Saint Quentin (Aisne);

Agent G. A. Guyot, 122 avenue de la République, Paris;
Precision lathes.

S.I.F.O.P.—(Société Industrielle pour la Fabrication d'Outillages de Précision), 65 avenue de Wagram, Paris;
Cutting and shearing tools of high precision.

Société Générale del Mandrins, 41 boulevarde Haussmann, Paris;
Universal mandrels for machine tools.

Société Industrielle de Delle, 19 rue des Filles-du-Calvaire, Paris;
Accurate mechanical screw taps and dies.

Société Nouvelle de Constructions Mécaniques, 8 rue Clairant, Paris;
Lathes, high-speed power hacksaws.

Société d'Outillage de Levallois-Perret, 15 rue Danton, Levallois-Perret (Seine);
Lathes, centering machines, presses, drilling machines, machine vises.

Établissements Hector Sudry, rue Beauséjour prolongée, Nantes (Loire-Inférieure);
Inclinable presses for trimming and embossing, shears.

R. Volet Sales office, 20 avenue Daumesnil, Paris;
Electric motors and small electric tools, drilling machines, polishers, etc.

J. Zehnder & Co., Granichen (Suisse) Switzerland;

Agent G. A. Guyot, 122 avenue de la République, Paris;
Universal grinding and sharpening tools.

Teyssou Frères & Cie., 36 rue Matignon, Paris;
Drilling machines (automatic screw machines built by R. Toratte, Montreuil, Sous-Bois (Seine), were also shown at this booth).

Armand Guillet, 8 rue Clairant, Paris;
Shapers, lathes.

L'Outillage R. B. V., 35 rue de Bagnolet, Paris;
Broaching machines.

Lucien Corvol, 21 rue J-J Rousseau, Montreuil (Seine);
Polishing and grinding machinery.

Rail Equipment Needed

The Manchurian government proposes to construct the Mukden Hai Lung Railway to extend about 150 miles in a direction Northeast from Mukden toward Kirin. Estimated requirements for this line include 18,000 tons of steel rails and accessories, 16 locomotives, and approximately 110 freight cars of different types.

Diplomacy Needed in Dealing Abroad

Arbitrary action in connection with a single shipment abroad can undo a comparatively large amount of upbuilding. This has been demonstrated within the past year when a piece of American machinery was sent to a European city. Some of the improvements shown in the catalog from which the machine was ordered were not embodied in the machine sent. This led to the belief that the order had been filled with an older model. The manufacturers claimed some of the improvements heralded in the catalog and embodied in some of the machines proved unsatisfactory and were not built into later production.

The European buyer could not be convinced that he had received a better machine. He wanted one exactly as cataloged and ordered. The row over the matter became known to all users of that type of equipment. The American shipper apparently made little effort to handle the matter diplomatically and as a result a pronounced prejudice sprang up against American machinery in general. This instance is being cited by those interested in the encouragement of export trade to emphasize the responsibility of each export shipper toward American trade as a whole.

Eight-Hour Day Not Practical in France

The Marquis de Dion, at the head of one of the famous French automobile firms, declares that the eight-hour day is the cause of much of the industrial misfortune of France these past months.

The reduction from the ten-hour day to eight hours affects the labor cost and overhead charges by 20 per cent. This is an axiom, of course, and the time has not yet come for France and the French workmen to benefit from this reduction in the hours of labor. Monsieur De Dion considers that temperamentally the French workman does not appreciate it. The same factor has brought about various (six in all) increases in railway rates for both passengers and freight. For the latter the automobile product turned out by his firm, to say nothing of raw materials as they are brought into the plant, have found transport charges increased variously from 20 to 900 per cent. The total increase in manufacturing charges has thus become considerable and the automobile industry is actually suffering.

In 1918, just after the war, and in the following year before the eight-hour law went into effect, the ten-hour and even twelve-hour day was the rule. Accordingly, prices of the particular commodity in which the De Dion-Bouton firm is interested suffered only from the unavoidable effects of the rising prices of the aftermath of war. The Marquis de Dion is a senator and has tried unsuccessfully to have the law repealed.

Both Monsieur Loucheur, Monsieur Schneider, and now the Marquis de Dion, are arguing for super-production in France, but not at a scale of wages and overhead and taxation which shall make such effort futile.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

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"BUSINESS in the United States," says an analyst whose views are most trustworthy, "on the whole still travels so smoothly that, lacking bumps and jars, most of us are scarcely conscious of the great speed it is making. Since its post-election trip started it has stopped once to change locomotives. It is now under way again for the next division point."

To explain a metaphor which might quickly become tiresome, the winter activity was carried on under the driving forces of speculative confidence and expansion in the primary industries such as steel. After the halt the automobile and building industries, hurrying on to their seasonal peak, picked up the business train and are still carrying it along. At the next stop we hope the farmers will be waiting, selling good crops at fair prices, to keep business moving into the usual good fall trade.

It is admitted that the outlook for the wheat crop is unsatisfactory; as of June 1 the Department of Agriculture forecasts a total yield of only 661,000,000 bu., 212,000,000 less than last year and the lowest since 1917. But of June 1 last year the department predicted a yield of only 693,000,000, while the final outturn was 872,673,000 bu., and it is entirely too early in the season to give up hope that we shall yet produce a crop that will allow us some surplus for export.

As for corn and cotton, predictions at this date are worthless; but it is at least possible, considering the acreage and the start of the crop, that we shall produce more cotton than last year. And the prices of all three of these crops and of most of the other things the farmer produces assure him of a cash income that will permit him to buy his full share of industrial production during the year to come.

That is what we have to look forward to after we pass through the so-called "summer slump," which, while it is almost as factitious and sentimental as the "bad business year" that Presidential elections are supposed to create, is nevertheless so widely expected that it generally arrives on schedule despite the efforts of a few enlightened people to forefend it.

It was reported last week that $8,000,000,000 yearly is being spent on the automobile industry, for new cars, garages, gasoline, maintenance, etc. We are now virtually at the seasonal peak of these enormous expenditures, for the manufacturers are only just beginning to report some relaxation of the spring demand for cars and contraction of output.

We are also still at the seasonal building peak, for contracts awarded during May made a new record for the month, according to the F. W. Dodge Corporation, surpassing last year by 18 per cent and falling only 9 per cent below April's total. Contracts awarded thus far this year have been 10 per cent in excess of the same period last year and the contemplated work reported is still heavy. As in some of the cities most of the housing shortage has now been made up, most of the building reports indicate a decline in the proportion of residential construction and an increase in the large projects undertaken principally by the public utility companies.

The extensive sales of bonds by these companies are another indication of their activity, for these borrowings are spent principally in the materials and equipment markets and in paying building labor; and while, as stated here last week, there is an element of danger to investors in the injudicious borrowing of which some of these companies may be guilty, there is no denying that they greatly stimulate business through turning the savings of many individuals back into the channels of productive enterprise.

With these two industries leading the way at such a rapid pace it is therefore not surprising that iron and steel are being bought a little more freely and mill operations are being fully maintained or increased, and that the coal business, long the chief center of depression in the country, shows slight but none the less definite signs of improvement, while building materials are moving in considerably greater volume than a year ago.

Nor is it surprising, to go further along, that trade is keeping up—that May retail trade was slightly in excess of a year ago, according to the Federal Reserve Board.

Such items are doubly significant when read with the fact that hand-to-mouth buying has not been abandoned and that we therefore face no long period of market stagnation except in the improbable event of a people as prosperous as the Americans arbitrarily cutting down their consumption at a price level which most producers find none to remunerative.

The weapon of hand-to-mouth buying is effectively used to prevent prices from rising beyond that level. Last week the trend of the major commodities, with the exceptions of lard, wool and hides, was downward. Wheat advanced momentarily on our government's crop report but declined when the high Canadian condition figure was issued.

So the record goes. Prices are better stabilized and in better relationship to each other than they have been since the war and in accordance with the tendency to maintain an orderly arrangement which is one of nature's laws, they resist pressure to pull them one way or the other. This stability is encouraging if it is not exciting, and it is far more important to business than the vagaries of speculation as expressed on the exchanges.

What's Doing in Industry

Reports gathered this week indicate that a healthy improvement is taking place in the machine tool and machinery equipment market. Orders are not large but are well scattered throughout the country among many types of customers.

The general manufacturing field apparently offers the best market. Steady expansion in production schedules calls for more efficient mechanical equipment, and the machinery most in demand today is of the type that decreases labor cost and time, while increasing output and profit.

The automotive market is holding up well and making the Middle-West an active market for machine tools. Also, manufacturers of agricultural machinery are doing a better business and are buying equipment in corresponding amount.

In Cincinnati orders have been increasing, some coming from sources quite unexpected. Chicago reports an active week, with the railroads doing the bulk of the buying. Manufacturers of farm implements lead buyers in the district centered at Indianapolis. Automotive buyers in Detroit continue to add new machinery to their plants.

The East pursues its normal course, railroads and industrials doing most of the buying. New York reports a slight increase in new orders for tools. Up in the New England states activity is below normal, although shops are busy.

The momentum attained by general business throughout the country continues unchecked. It cannot be said that we are in the midst of a boom. Rather are we pursuing a sensible and quite normal program of activity that should continue for some time.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Chicago

Railroad inquiries during the last few days have had a tendency to create a more active tone in the Chicago machinery market, which continues quiet so far as industrial demand is concerned. The roads referred to are the Atchison, Topeka & Santa Fe; the Chicago, Burlington & Quincy, and the Chicago, Rock Island & Pacific. The A. T. & S. F. is inquiring for a 2-in. double-head bolt cutter. The Burlington is in the market for a triple- and a double-head bolt cutter, a 32-in. shaper, two upright drills, a 24-in. geared-head engine lathe, a 54-in. vertical turret lathe and a power bending roll. The Rock Island inquiry is for a four-spindle drill.

The fire which partially destroyed the machine shop of the National Fireproofing Co. at Ottawa, Ill., has necessitated the replacement of several machine tools, for which the company is now in the market. The Chicago Board of Education, through the department in charge of the technical work in high schools, announces that with the opening of a new addition to the Schurz High School, next month, there will be needed a complete equipment of woodworking machine tools, for which an appropriation of $10,000 has been made. Through the same source, it has been learned that the five high schools to be opened in September will need equipment consisting of woodworking, blacksmithing, auto mechanic, foundry and other machinery and tools for the technical departments, a list of which will be given out later.

Buffalo

The last week in May and the first week in June showed a genuine upturn in Buffalo business which was felt by most of the machinery dealers and associated interests. It seems certain that the first six months of 1925 will compare favorably with the first six months of 1924.

The demand for road-building equipment continues to be exceptionally good; probably the best for the last four months that was ever experienced in this part of the country. This is not true, however, of heavy construction equipment and materials. Nor is it true of heavy cranes and the like in which business has been below normal.

Reports from various industries and machine shops indicate that most of them are gradually taking on additional workers.

At least two firms have received large orders in the last week of May or the first week of June as a result of effort put forth earlier. Three firms report January the best month of the year and May as the next best. If June continues at its present pace, it will exceed either May or January.

Manufacturers of brass goods are active, particularly on equipment for steam and heating purposes such as radiator valves.

The New York Central is the only railroad which seems to be actively in the market for equipment. It has a list out for equipment at Depew, N. Y., and at Avis, Pa. The Buffalo steel and iron interests are for the most part inactive.

The Buffalo Forge Co. reported that the general business of the company was good and that business received during May compared favorably with that of other months, both this year and last.

Detroit

Steady production on the part of Michigan's leading automobile manufacturers is resulting in the same steadiness being shown in the machinery and machine tool fields in Detroit and vicinity.

While the May figures show that production fell off slightly from that of April, representatives of machine tool firms here report that the automotive plants are purchasing in goodly amounts preparatory to the new models which will be announced during the summer.

The Ford Motor Co. is preparing to purchase equipment and machinery for the new rolling mills at the River Rouge plant. The locomotive shops of the D. T. & I. will have extensive additions also.

The Hudson Motor Car Co. is in the market for some special machinery needed in the assembly line which is now loaded with some 1,100 or 1,200 cars a day.

Greater activity has been noted in the past two weeks in railroad circles. The Pennsylvania's plans call for the expenditure of more than two millions in Detroit. The Pere Marquette and Michigan Central are also buying rails and tools.

Cincinnati

After summing up trade conditions as a whole, taking the cumulative experience of Cincinnati makers and retailers of machine tools, it is manifest that the business trend is still upward. Heads of concerns express themselves as being encouraged by general business conditions. Practically all report that this week shows an increase over the previous week, and also over the corresponding week of last year.

Export business is still reported to be below normal, but foreign demand is getting better week by week. Orders still continue to come in from the automotive industries.

Orders and inquiries continue to be well scattered.

"There are still a few surprises left in the business," stated a manufacturer of small machine tools. "For instance, we have been getting a lot of orders from sources from which we did not expect them, and we have failed to get a few orders that we regarded as a sure thing. This indicates to me that we may be confining ourselves too much to the old outlets and not paying enough attention to the development of new."

Indianapolis

An expansion in demand for machinery and tools in this district is being welcomed by the trade. The expansion is not marked, it is true, but some of the soft spots are becoming firmer and many industries which have curtailed buying almost to the vanishing point, are not only making inquiries, but are buying more readily than they have at any time since the first two months of the year.

A steady demand continues to come from the farm implement factories in the state. Business with these plants continues rather better than was expected and officials say there are no indications yet of slack orders. The railroads are not buying much, but the last two weeks has seen more orders from this source than for some time, and prospects are brighter.

Local automobile plants continue to produce much heavier than last year and are buying accordingly. Marmon and Stutz appear to be particularaly busy. This increase appears to be reacting on the accessory business, for local factories report a big volume of orders and most of them are working at capacity. A fair demand for machinery comes from the furniture industry, but for two months now these plants have been cautious purchasers and the volume of buying is not what was promised earlier in the year.

New England

Through the Manufacturers' Association of Hartford County, in Connecticut, a good index to the machine industry in the machinery centers is obtainable. The records for Hartford show employment is 91 per cent of the employment peak and operating schedules are 98 per cent normal, giving an average of 90 per cent in man-hours. In New Britain employment is at 95 per cent, running time 94 per cent, and man-hours 89 per cent; and in Bristol employment is 85 per cent, running time 97 per cent, and man-hours 85 per cent.

These figures are about 85 per cent concerned with the machinery industry. In Hartford the bulk of manufacturing relates to machinery building; in New Britain it is hardware and allied metal industries; and in Bristol the business is largely relative to the automobile industry.

In New Britain factories will close for periods from a week to ten days' duration over the Fourth of July. The hardware manufacturing plants will not close.

Canada

With continued steady demand from the automotive and railroad shops and from the building industry, the machine tool business of Canada is enjoying a fair amount of activity, although the demand is mostly for small units. The general trend of business in the Dominion is upward. Orders for steel are fairly numerous. Business in old materials is fair and prospects are good.

An order has been placed with the Dominion Iron & Steel Co. for 1,500 tons of nails. It is estimated the new order will keep the mill going double shift for at least a month. It is reported that two of the three blast furnaces now in operation at the Sydney plant of the British Empire Steel Corp. will be blown out shortly, but the third will continue in operation to supply iron needed for steel making and for the operation of the wire, nail and other mills.

New York

The industrial field continues to be the best customer of the machine tool and equipment manufacturer in this market. While buying from this source has been more or less on a hand to mouth basis, it nevertheless furnishes a steady volume of orders that is much sought after by both manufacturers and dealers.

On the whole business is spotty, orders coming in from scattered localities and being divided among a wide range of types. The one outstanding feature of this market is the fact that practically all orders for machines are aimed at the reduction of production costs. With the general reorganization of business programs during the first half of this year has come a wave of production economy, and machinery is the element that is expected to effect savings where labor costs and material advances have added to the burden of manufacturing. Limit production costs—by cutting labor and material costs and by the use of more efficient machinery—is the slogan of modern industry.

Few inquiries of any consequence have made their appearance in the past week. Railroads are in the market for some machine tools and equipment for repair shops, but they are slow in placing orders. One order placed through a local firm was for a group of machines for the Chicago, Rock Island & Pacific. It included two lathes, a boring mill, a planer, two radial drills and a wheel press. Another substantial order was for a large lathe and a car-wheel borer for the Philadelphia rapid transit system.

Amortization of European Debts Will Not Affect Industry Adversely

To pay their war debts to the United States, European countries will have to remit a total of approximately $30,000,000,000. The effect of such debt payments on European trade and industry, according to a preliminary study of the Inter-Ally debt problem made by the National Industrial Conference Board, is likely to be intensified specialization in quality manufacture and luxury goods; and exports of manufactured goods perhaps no greater in quantity or number than at present, but of such increased value as to pay for the needed food and raw materials and to leave a balance sufficient to meet the debt obligations.

In the view of the board's analysis, not too great weight is to be given to the prediction often heard and widely accepted that American industrial progress is about to receive a rude check owing to renewed competition by European industries favored by exceptionally low wage rates, depreciated currency, and unstable exchange rates. The fundamental and permanent factor in determining the relative character and rate of industrial progress and prosperity, it is emphasized, is raw materials; their abundance, availability and "increasability" on demand. In this respect, it is declared, the competitive position of Europe would appear to be fundamentally inferior to that of the United States. Europe, with her relative scarcity of raw materials, but abundance of cheap labor, tends to revert more and more toward quality manufacturing, her products representing a greater proportion of labor expended on smaller amounts of materials, while the United States, with her vast abundance of raw materials, will continue to develop along the line of greater quantity production with a minimum of labor, it is pointed out. Debt payments will intensify this difference between European and American production, to the end of decreasing competitive friction during the period of the amortization of the debts.

New Haven Announces Changes in Mechanical Staff

To perfect the mechanical organization, W. L. Bean, who was recently made mechanical manager of the New York, New Haven & Hartford Railroad Co., has with the approval of the management announced readjustments in the personnel of the mechanical forces under his jurisdiction.

George A. Moriarty, who has been mechanical superintendent of the lines East, with headquarters at Boston, has been made general mechanical superintendent, with future headquarters at New Haven. To succeed Mr. Moriarty as mechanical superintendent F. E. Ballda has been named. Mr. Ballda was formerly assistant to the mechanical manager with headquarters at New Haven.

Kenneth Cartwright is made assistant mechanical manager in charge of specifications, designs, records and standards of equipment. H. P. Hass is made assistant to the mechanical manager, having been special assistant to the mechanical manager up to this time.

In the course of the readjustment J. H. Lofland, marine superintendent, has been placed under the jurisdiction of the mechanical superintendent of the New York Division so far as maintenance is concerned, and under the general superintendent where operating matters are affected. The engineer of tests will report to J. C. Hassett, mechanical engineer. A. J. Devlin, general supervisor of production will report to Mr. Bean, mechanical manager.

Recommended Practices Ready for Distribution by A. S. S. T.

The American Society for Steel Treating has issued additional pages for its handbook of recommended practices covering the heat treatment of 18 per cent tungsten high-speed steel, and for the heat treatment of plain carbon tool steel.

These two recommended practices have been before the A.S.S.T. for over a year and were recently revised by a sub-committee on tool steel and finally adopted by the society.

Copies of these practices will be sent to members of the Society this month and it is expected that additional copies will be available to those who desire them.

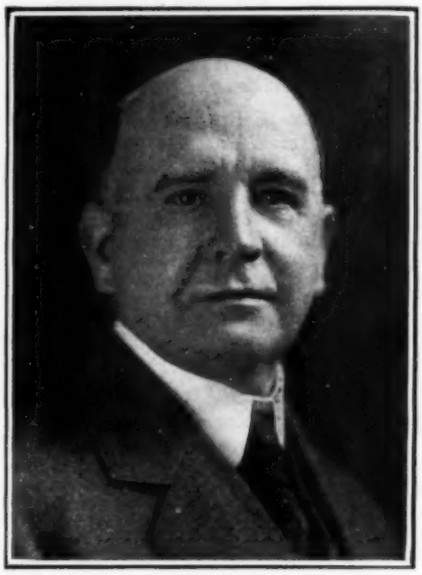
James H. McGraw Establishes Awards for Electrical Men

To encourage individual initiative and creative thinking among electrical men, James H. McGraw has established four annual awards, three to be competed for by the men of the manufacturing, jobbing and contractor-dealer branches of the electrical industry respectively, and the fourth to be open, in addition, to the men of the central-station industry.

Each year on the occasion of the meeting of either the Associated Manufacturers of Electrical Supplies or the Electric Power Club, a medal and a purse of one hundred dollars will be awarded to that employee or official of any manufacturing organization of the United States or Canada, who during the year 1924 made the most constructive contribution to the commercial development of the electrical manufacturing industry through the suggestion of an idea that has been successfully applied to the product, the promotion of the market or the improvement of service. The medal and the purse will be awarded by the Prize Jury to that man whose submitted statement, endorsed by an executive of his organization, appeals to the judges as offering the greatest value to the electrical manufacturing industry. Similar medals and purses feature the other three awards.

McSkimmon Heads Union Twist Drill Company

At a meeting held June 13, W. B. McSkimmon was elected president of the Union Twist Drill Co., Athol, Mass., owner of the S. W. Card Manufacturing Co., of Mansfield, Ohio, and of the Butterfield Tap & Die Co., of Derby Line, Vt., and Rock Island, Canada. Mr. McSkimmon was born in Bangor, Me., on March 2, 1872. He was graduated from high school and then started his shop career which led him from apprentice to his present well-earned honor. Hard work and unusual natural ability brought him up through such steps as treasurer of the S. W. Card Co., and secretary of the Union Twist Drill Co., vice-president and general manager of the Union Twist Drill Co. and its subsidiaries, and now to the head of the organization.



W. B. McSkimmon

Aeronautical School at New York University

New York University has just received from Daniel Guggenheim the sum of $500,000 for the establishment of a school of aeronautics within the department of engineering. In the letter accompanying his gift Mr. Guggenheim announced his desire to aid in the education of highly trained engineers capable of building better and safer commercial aircraft, and industrial engineers capable of making the operation of aircraft as a business proposition comparable to the operation of railroads.

Part of the fund will be used for the purpose of building and equipping a building, to be known as the Daniel Guggenheim School of Aeronautics, a wind tunnel, propeller laboratory, sand-testing laboratory, model shop, full-flight laboratory, power plant laboratory and classrooms. The balance will cover maintenance of buildings and equipment and the salaries of the professor in charge and his four assistants.

Personals

E. J. FULLAM, secretary and treasurer, and W. F. SLOMER, general sales and service manager of the Fellows Gear Shaper Co., Springfield, sailed June 9 on the *Aquitania* on a business trip covering the following countries: England, France, Germany, Belgium, Switzerland and Italy. They expect to return about the second week in August.

CHARLES N. RING has been appointed assistant director of the Electric Steel Founders' Research Group, succeeding W. J. Corbett who resigned to become secretary-manager of the Steel Founders' Society of America. Mr. Ring was formerly works manager for the Allied Steel Castings Co., at Harvey, Ill., and has been associated with the foundry industry for many years.

J. L. PRICE, vice-president and treasurer of the Chicago Pneumatic Tool Co., has been appointed vice-president and general manager of the newly formed Bendix Corporation of Chicago, and also general manager and president of the Bendix Brake Co., of South Bend, Mich.

A. A. BOSCHERT has been appointed sales engineer for the Harnishfeger Corporation, with headquarters in Seattle, Wash.

JOSEPH M. BROWN has joined the sales organization of the Chicago Malleable Castings Co., Chicago.

C. P. WRIGHT has been appointed vice-president of the American Brake Shoe and Foundry Co., Chicago. Mr. Wright was formerly assistant to the vice-president.

JAMES P. GROOME has joined the sales force of Manning, Maxwell & Moore, Inc., and is attached to the Chicago office.

CLIFFORD E. PIERCE, of the Betz-Pierce Co., of Cleveland, has been elected president of the Massillon Steel Castings Co., Massillon, Ohio. He succeeds Emmett H. Birney who resigned to take up new duties with the Union Drawn Steel Co., Beaver Falls, Pa.

E. T. SPROUL, formerly general manager of sales of the Trumbull Steel Co., Youngstown, Ohio, has been made assistant to the vice-president. In that capacity he will continue to have sales department relations as well as general duties.

SIR GLYNN WEST, chairman of Sir W. G. Armstrong, Whitworth and Co., Ltd., has been made president of Charles Walmsley and Co. (Canada) Ltd., Longueuil, Quebec.

DANIEL H. BRAYMER has resigned as editorial director of the INDUSTRIAL ENGINEER in order to devote the major part of his time to the activities of the recently organized D. H. Braymer Equipment Co., Omaha, Neb.

A. Z. MITCHELL, for many years factory manager of Dodge Brothers, Inc., has been appointed vice-president in charge of manufacturing.

CHARLES H. SYLVESTER has been appointed chief engineer for the Walcott Lathe Co., Jackson, Mich.

FRANK E. MUTTON, formerly head of the Canadian interests of the International Business Machines Co., who has for some time been in the United States, has returned to Canada and is opening an office in Toronto where he will operate as a business economist.

HUBERT W. ROBERTS, who recently resigned as vocational director of the Anderson, Ind., schools to accept a position at the Remy electric plant in that city, has accepted a position as director of personnel at the Olds Motor Works, Lansing, Mich. Mr. Roberts will resign his duties as chairman of the Anderson recreational commission.

Business Items

The Reed-Prentice Co., of Worcester, Mass., announces the appointment of the Stocker-Rumely-Wachs Co., 117 N. Jefferson St., Chicago, as its representative in the Chicago territory. This representation will cover Illinois, north of and including Springfield; Indiana, north of but not including Fort Wayne; Michigan, upper peninsula, and counties of Ottawa, Van Buren, Berrien, St. Joseph, Kalamazoo, Allegheny, Cass, Kent and Muskegon; Wisconsin, eastern portion; Iowa and Nebraska.

The Timken Roller Bearing Co., of Canton, Ohio, announces the retirement of Heman Ely, vice-president and treasurer, from active connection with the company. Mr. Ely became associated with the Timken company in 1909 as secretary, and in 1916 was appointed treasurer. He became vice-president and treasurer in 1920. The board of directors of the company, following Mr. Ely's retirement, consists of H. H. Timken, W. R. Timken, J. G. Obermier, M. T. Lothrop, and J. F. Strough, with officers as follows: H. H. Timken, president; W. R. Timken, vice-president; J. G. Obermier, vice-president; M. T. Lothrop, vice-president; H. J. Porter, vice-president; J. F. Strough, secretary and treasurer; W. A. Brooks, assistant secretary. H. J. Porter, who has been general sales manager, is advanced to vice-president in charge of sales. L. M. Klinedinst, heretofore assistant to Mr. Porter, becomes general sales manager of the industrial division.

The Foote Bros. Gear and Machine Co., Chicago, announces that it has recently completed arrangements with the McBurney Stoker and Equipment Co., 619 Trust Co. of Georgia Bldg., Atlanta, to represent the IXL line of speed reducers and general gear products in the state of Georgia.

The Hart-Parr Co., tractor manufacturer, Charles City, Iowa, held a meeting at Charles City on June 9 for the purpose of reorganizing the company to take over the assets of the old Hart-Parr Co. The stockholders and several others will purchase the new Hart-Parr Co.'s securities, which will

provide working capital to immediately expand the business. Several other products besides tractors are now being manufactured by the Hart-Parr Co., including stationary engines, Newport boilers, air compressors, and the Hart-Parr washing machines. The old name of Hart-Parr will be retained by the new company and the officers will be the same.

Ernest M. Howe, British transportation expert, has been elected president of the Gray Motor Corporation. With the announcement of the new president it was also made known that arrangements have been completed for a new financing program which will make available for the operation and expansion of the company cash in excess of $1,000,000. Other new officers elected are: Henry W. Burritt, vice-president and treasurer; and B. M. Schultz, secretary. The new directorate will consist of Paul Gray, O. J. Mulford, Fred J. Robinson, Frank Beall, Henry W. Burritt, Ernest M. Howe, Herbert B. Hoyt, David A. Brown, Charles P. Norcross, Benjamin S. Hanchett and Henry Melville. Besides production of Gray motor cars, it was announced that the company will be sole manufacturers in the United States for the Tilling-Stevens Corporation, making the Tilling-Stevens gas-electric bus, widely used in Europe. The bus as put out by the Gray Corporation will be American made except for the electric drive and control.

The Dallman Machine and Manufacturing Co., of Milwaukee, has taken over the plant of the Obenberger Forge Co. at West Allis. The Dallman company builds special machinery and equipment.

The Brown Hoisting Machine Co., of Cleveland, has taken over the manufacture of rotary steam engines for Baker Motors, Inc., of Erie, Pa.

The Atlas Steel Castings Co., of Buffalo, N. Y. has moved its New York office from 200 Fifth Ave. to 30 East 42d Street.

The Browning Crane Co. is the new name adopted by The Browning Company, of Cleveland, Ohio, makers of locomotive cranes and similar equipment.

The Standard Tank Car Co., of Sharon, Pa., has just announced several changes in its board of directors. The board now includes James Andrews, vice-president and general manager; Walter P. Chrysler, chairman of the board of the Maxwell Motor Corporation; William F. Cutler, president of the Southern Wheel Co.; Duncan A. Holmes, vice-president of the Chase Securities Co.; Stewart McDonald, president of the Moon Motor Co.; Grayson M.-P. Murphy, chairman of the board; J. B. Orr, president; Samuel F. Pryor, chairman of the executive committee of the Remington Arms Co.; Ernest Stauffen, vice-president of the New York Trust Company.

The Pittsburgh Screw & Bolt Co. has purchased the Continental Bolt & Iron Co., of Chicago. The new acquisition will be merged with the Gary Screw & Bolt Co., of Gary, Ind., which is the Western branch of the concern.

The Kempsmith Manufacturing Co., of Milwaukee, announces the election of the following officers: Edwin Wallaeger, president; John Goetz, vice-president, chairman of the board of directors, and general manager; F. Wallaeger, Jr., treasurer; Edward Leason, secretary.

A syndicate of New York bankers offered last week 100,000 shares participating preference stock of the P. B. Yates Machine Co., of Beloit, Wis., at $28.25 to net 9.20 per cent. The company is one of the largest manufacturers and distributors of woodworking machinery in the world. Consolidated net income for the three years ended December 31, 1924, after all charges, depreciation, income taxes and bond interest, average $727,956 per annum.

Fifteen airplane pilots from the U. S. Army aviation experimental station at McCook Field, Dayton, Ohio, were in Indianapolis recently and inspected the plant of the Nordyke & Marmon Co. The company recently re-equipped its automotive plant, embodying many advanced ideas in engineering.

It is announced that the Hamilton, Ontario, plant of the International Harvester Co. will open a twine factory in addition to its present undertakings. Machinery and equipment will require eight acres of floor space.

The Massey-Harris Co. is considering the erection of a factory in France to produce implements for the continental market.

The announcement has been made that the Dodge Manufacturing Co., Toronto, Ontario, is opening a branch in Winnipeg, Manitoba. The intention is to carry a complete stock of power transmission machinery.

The McCord Radiator and Manufacturing Co., of Detroit, has acquired the business of the National Radiator and Machinery Corporation, of Detroit. The sale includes inventories, equipment, patents, and good will, but does not include the plant and real estate. It is planned to continue the operation of the National plant intact for the present, but ultimately this business will be merged with the McCord plant at East Grand Boulevard and Riopelle Street.

The tenth annual course in industrial organization and administration at the Pennsylvania State College will begin June 22 and will contnue until July 3. The course will be under the direction of the industrial engineering department of the college and will be personally supervised by Professor J. O. Keller. The work in time study and manufacturing methods will be conducted by C. W. Beese, formerly associated with the Westinghouse Electric & Manufacturing Co. G. F. Mellen will conduct the course in industrial accounting, and C. E. Bullinger will have charge of factory planning and employees' service.

The American Welding and Manufacturing Co., of Warren, Ohio, has purchased the Phenix Tube Co. in Warren. The property consists of ten acres of ground and one factory building. The sale was handled through Edgar M. Moore & Co., of Pittsburgh.

Obituaries

MANSFIELD MERRIMAN, professor of civil engineering at Lehigh University, and a pioneer in technical education in this country, died in New York City on June 7. Professor Merriman was widely known as a scientist and educator and held several honorary degrees from leading universities. At different times he was president of the Society for the Promotion of Engineering Education and of the American Society for Testing Materials.

FREDERICK H. BULTMAN, president of F. H. Bultman Co., Cleveland, manufacturer of special machinery, died on June 6. He was eighty-seven years old.

THOMAS G. COX, treasurer of the Mason Machine Co., Taunton, Mass., died June 3 in Boston.

JOHN P. DUNN, owner of the Dunn Machine Co. and the Buffalo Drop Forge Co., died May 31 at his home in Buffalo, N. Y.

BURT W. PIERCE, for twenty years associated with Jos. T. Ryerson & Son, Inc., of Chicago, died on June 2 in Grand Rapids, Mich. He was thirty-nine years old.

GEORGE BARNES, superintendent and one of the owners of the Charles Barnes Co., of Cincinnati, engine builders and general machinists, died June 7th, at his residence in that city. Mr. Barnes was best known as a designer and constructor of marine engines, many of which were placed in steamers on the Ohio and Mississippi Rivers. His brothers, Charles Barnes, president, and Americus W. Barnes, secretary, will continue the business.

ARTHUR HUGH BALDWIN, managing director of Kendall & Gent, Ltd., milling machine manufacturers, Manchester, England, died on May 24, at the age of 70. He was trained by Sharp, Stewart, Ltd., Manchester, and later became a partner in Kendall & Gent in 1880. He was subsequently appointed managing director when the firm was turned into a limited liability company. He was a member of the London Institute of Mechanical Engineers.

MILTON O. REEVES, widely known manufacturer, of Columbus, Ind., died at his home recently. In 1884 he took a clerical position with Reeves & Co., manufacturers of threshing equipment. When the Reeves Pulley Co. was organized in 1888, Mr. Reeves was made president and held that position until the time of his death.

JOHN LAVELLE, SR., seventy-nine years old, head of the Lavelle Foundry Co., Anderson, Ind., and for years one of the most prominent manufacturers there, died recently following a few hours' illness. Mr. Lavelle settled in Anderson 45 years ago and was employed by the Anderson Foundry and Machine Co. He started the Lavelle foundry twenty-two years ago. The company now has two plants in Anderson, one at Argos, Ind., and one in Indianapolis.

Trade Catalogs

Herringbone Gear Speed Reducers. The Falk Corporation, Milwaukee, Wis. Bulletin No. 38 describing the latest line of Falk herringbone gear speed reducers. The text wastes little time on idle words concerning the products, but confines most of its forty-eight pages to technical descriptions and details and data of specific types of gears, machines and their adaptability. With each type illustrations are given and tables of data and operations are included. Reproductions of blueprints also help to make the reading interesting and clear.

Barker Chucks. The Thomas Elevator Co., Chicago, Ill. Catalog N. 3 containing descriptions and tables of sizes and capacities of the modern Barker wrenchless chucks made by this company. Illustrations are included, and those showing the nomenclature of certain models are quite useful in helping the reader visualize the construction of the chucks. Other illustrations show the chucks in actual operation on various machine tools.

Recording Thermometers. The Bristol Co., Waterbury, Conn. Catalog No. 1303, containing fifty-six pages devoted to a wealth of valuable information about the various types of gas filled recording thermometers made by this company. All temperature ranges between 60 deg. below zero and 1,000 deg. F., are covered in the instruments described in these pages. Various types of thermometers are shown in operation by illustrations which accompany the text. Other illustrations show reproductions of temperatures arrived at in actual operations.

Electrical Recording Instruments. The Bristol Co., Waterbury, Conn. Bulletin No. 332 describing some new developments in this company's electrical recording instruments. This bulletin supplements Catalog No. 1501. Improvements in the new models are described and illustrated.

Prentiss Vises. The Prentiss Vise Co., New York, N. Y. The fifty-third illustrated catalog and price list issued by this company. It is a well-made up book, bound in heavy paper covers and contains over fifty pages of information on the several types of Prentiss vises. Illustrations of complete machines, parts, and also views of the Prentiss plants are given. The leading description is devoted to the latest improvement in a new collar fastening for screws. Tables of sizes, prices and other useful data are included; also a private ordering code for the convenience of customers.

"Quickwork" Rotary Shears. The Quickwork Co., St. Marys, Ohio. Catalog No. 80 containing over one hundred and twenty pages of information and illustrations of "Quickwork" rotary shears. This is one of the finest catalogs that has come to us. It is finely bound in good quality, imitation leather covers, and printed on fine coated paper, which gives added beauty to the well-made illustrations. The book contains a wealth of useful data too numerous to mention here, but some of the divisions are: Standard machines, specifications, operations, motor drive and optional and special features. Each of these subdivisions is complete with tables, charts and illustrations, so that each picture is laid before the reader in complete detail.

Handling Costs. The Cowan Truck Co., Holyoke, Mass. A thirty-six page catalog giving specific examples of savings being made by manufacturers who use Cowan trucking equipment in their shops. The first few pages contain lists of users of Cowan trucks and these users are in turn mentioned later when the examples of work being done by the trucks are described. Illustrations of several Cowan models, together with descriptions of actual work being done are included.

Drop Forgings. The Storms Drop Forging Co., Springfield, Mass. A six-page circular giving some brief data, with illustrations on the drop forging work done by this company.

"Diamond" Grinding Machine. The Diamond Machine Co., Providence, R. I. Bulletin No. 617 just issued by this company, containing descriptions and illustrations of latest improvements in the belt and motor-driven ball bearing grinding and polishing machines made by the company. The catalog is in two sections, one devoted to the new heavy-duty swing frame grinding machine, and the other to ball bearing grinding and polishing machinery.

High Speed Tools. The Cleveland Twist Drill Co., Cleveland, Ohio. **Catalog No. 41** containing over two hundred and forty pages bound in heavy covers. The contents is a complete list of specifications of the various drills made by the "Cle-forge" process, each type being fully described and many illustrated. Several new items are included—special drills for bakelite and slate, carbon drill sets, spiral fluted, taper shank bridge reamer and car reamer, spiral fluted taper pin reamer, three new sizes of quick-set adjustable reamers for automotive shops and a section of mechanical data.

Jacklift and Stacker Practice. The Lewis-Shepard Co., Boston, Mass. The annual catalog of this company, showing thirty-three installations of Jacklifts and Stackers, including brief descriptions of each. The catalog also shows views of the new factory of the company, which has been greatly enlarged in the past year.

Electric Power Apparatus. The Electric Machinery Manufacturing Co., Minneapolis, Minn. Bulletin No. 799, containing a wide range of data on automatic starters for synchronous motors. Descriptions of various types of apparatus are given, with illustrations, and also included is a list of prominent users of such equipment.

Hanna Yoke Riveters. The Hanna Engineering Works, Chicago, Ill. Catalog R-205 illustrating and describing a complete line of Hanna compression yoke riveters. These machines are fully illustrated and sketches are included to show to better advantage the construction and operation of the machines. Many examples of work done by the machines are also shown.

Calendar of Local Meetings

American Society of Mechanical Engineers

Atlanta, Ga. June 18. Supper meeting and election of officers.

Denver, Col. June 26. Regular business meeting and election of officers. Excursion to radio stations in Denver.

Portland, Ore., June 22 to 25. Pacific Coast Regional Meeting.

National Association of Cost Accountants

Western Massachusetts. June 23.

Pamphlets Received

Malleability and Metallography of Nickel. By P. D. Mercia and R. G. Waltenberg. Published by the Bureau of Standards, Washington, D. C. Technologic paper No. 281, the results of an investigation conducted at the bureau under a scholarship maintained by the International Nickel Co. In the manufacture of "malleable" products certain difficulties are encountered in order to produce a casting sufficiently malleable and ductile for subsequent forging operations. This investigation sought to overcome this trouble, and the details of the experiments are set forth in this pamphlet. Illustrations show the metals under microscopic examination and the various conditions under the tests. The conclusions are set forth in the final chapter.

Good Will and Its Valuation. By A. C. Ernst, manager, Ernst & Ernst, New York. A reprint of an article written a short time ago by Mr. Ernst for *Printers' Ink*. The text tells what Good Will consists of and the many ways in which it affects business, its influence on security prices, its relation to tangible assets and how it may be appraised. Court decisions are quoted bearing on the taxability of Good Will. Other useful information is included.

Trade Associations: Their Economic Significance and Legal Status. Published by the National Industrial Conference Board, New York. This study of trade association activities was made under the direction of an able committee of industrial executives, economists and lawyers, after two years of extensive investigation by the research staff of the Board. It is probably the most comprehensive story of trade association work available. The contents cover the following points: Trade associations and the anti-trust laws; trade association activities and the suppression of competitive conditions; trade associations and the regulation of competitive conditions; trade association activities essentially unrelated to competitive conditions; the place of trade associations in the industrial structure. Copies may be had from the headquarters of the Industrial Conference Board, 247 Park Ave., New York. A limited edition has been printed and the cost is small.

Automatic Arc Welding. Published by the General Electric Co., Schenectady, N. Y. Bulletin No. 48937.1, in the form of a treatise on arc welding. It gives a résumé of the uses and value of automatic arc welding, together with a description of the welding apparatus and generating equipment used. Twenty pages of interesting and useful data are given, with illustrations of apparatus and its application to actual work.

Forthcoming Meetings

National Association of Cost Accountants. Sixth international cost conference, Detroit, Mich., June 15, 16, 17 and 18. Headquarters at Hotel Statler. Secretary, Stuart C. McLeod, 130 West 42nd Street, New York City.

Division V of the American Railway Association. Business meeting June 16 to 18, Chicago. V. R. Hawthorne, 431 S. Dearborn St., Chicago, Ill.

Society of Automotive Engineers. Summer Meeting. Greenbrier Hotel, White Sulphur Springs, W. Va., June 16, 17, 18 and 19. C. F. Clarkson, secretary, 29 West 39th St., New York City.

American Society for Testing Materials. Twenty-eighth annual meeting. Chalfonte-Haddon Hall Hotel, Atlantic City, N. J., June 22, 23, 24, 25 and 26. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

National Foreign Trade Council. Annual Convention. Seattle, Wash., June 24, 25 and 26. O. K. Davis, secretary, India House, Hanover Square, New York City.

American Railway Tool Foremen's Association. Annual convention, Hotel Sherman, Chicago, Ill., in August. G. G. Macina, C. M. & St. P. Ry., 1402 Calumet Ave., Chicago, Ill.

International Railway General Foremen's Association. Annual convention, Hotel Sherman, Chicago, Sept. 8, 9, 10 and 11. William Hall, secretary and treasurer, 1061 W. Wabash St., Winona, Minn.

New Haven Branch of the American Society of Mechanical Engineers. Fifth annual machine tool exhibition. Sept. 8 to 11. Mason Laboratory. H. R. Westcott, chairman.

Association of Railway Supply Men. Annual convention and exhibition. Hotel Sherman, Chicago, Sept. 8, 9, 10 and 11. Earl E. Thulin, secretary, the Duff Manufacturing Co., 715 People's Gas Bldg., Chicago.

American Society for Steel Treating. Annual Convention and National Steel Exposition. Public Auditorium, Cleveland, Ohio. Week of Sept. 14. W. H. Eisenman, Secretary, 4600 Prospect Ave., Cleveland, Ohio.

Production Meeting Society of Automotive Engineers. Sept. 14, 15 and 16. In conjunction with American Society for Steel Treating. John Younger, chairman; G. F. Clarkson, secretary, 29 West 39th St., New York City.

Management Week. Conducted jointly by five societies—The American Society of Mechanical Engineers, The American Management Association, The National Association of Cost Accountants, The Taylor Society and the Society of Industrial Engineers. Week of Oct. 19 to 24. W. L. Conrad, of the A. S. M. E., is chairman of the joint committee.

The Weekly Price Guide

Rise and Fall of the Market

Iron quotations unchanged during past week; demand about the same. Scrap up 50c.@$1 per ton since June 5. Weakness persists in steel sheets. Shapes are $1.90@$2.10 per 100 lb., Pittsburgh; plates, $1.90@$2 and bars, $2@$2.10. Compared with a week ago, the price of tank plates appears a trifle softer. The Vacuum Oil Co. placed an order with the Chicago Bridge & Iron Works for 57 tanks for Australia and New Zealand, involving 2,500 tons of steel. Automotive buying is most active; reinforcing bars slower. Drop in steel demand shown by orders on books of U. S. Steel Corp., May 31, of 4,049,800 tons, against 4,446,568 on April 30 and 3,628,089 tons on May 31, 1924.

(All prices as of June 12)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$23.05
Northern Basic	22.27
Southern Ohio No. 2	22.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	27.37
BIRMINGHAM	
No. 2 Foundry	20.00@21.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	23.26
Virginia No. 2	29.17
Basic	22.26
Grey Forge	22.75
CHICAGO	
No. 2 Foundry local	22.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	25.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	22.77
Basic	22.77
Bessemer	22.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No. 10	2.40@2.50	3.89	3.15	3.80
No. 12	2.45@2.55	3.94	3.20	3.85
No. 14	2.50@2.60	3.99	3.20	3.95
No. 16	2.60@2.70	4.09	3.35	4.15
Black				
Nos. 17 to 21	2.95@3.30	4.15	3.95	4.30
Nos. 22 to 24	3.00@3.35	4.20	4.00	4.35
Nos. 25 and 26	3.05@3.40	4.25	4.10	4.40
No. 28	3.15@3.50	4.35	4.15	4.50
Galvanized				
Nos. 10 and 11	3.25@3.60	4.35	....	4.50
Nos. 12½ to 14	3.35@3.70	4.45	....	4.60
No. 16	3.50@3.85	4.60	....	....
Nos. 17 to 21	3.65@4.00	4.75	....	4.90
Nos. 22 to 24	3.80@4.15	4.90	4.75	5.05
No. 26	3.95@4.30	5.05	4.90	5.20
No. 28	4.25@4.60	5.35	5.20	5.50

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	59½%	48%
3½ to 6 in. steel lap welded	48%	35%	53½%	40½%	56½%	45%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%, less 5%; class A, plus 23%. Cast iron, standard sizes, 36% off.

Size, Inches	List Price per Foot	Diameters Inches External	Diameters Inches Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.09	50%	⅞	$0.16	35%
⅜	.11	45%	1	.18	31%
½	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	....	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.05	8.00	7.20
Hoop steel	4.49	3.85	4.15
Cold rolled strip steel	6.35	8.25	7.85
Floor plates	5.55	5.60	5.50
Cold drawn shafting or screw	4.15	4.00	3.80
Cold drawn flats, squares	4.65	4.50	4.30
Structural shapes (base)	3.34	3.20	3.10
Soft steel bars (base)	3.24	3.10	3.00
Soft steel bar shapes (base)	3.24	3.11	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.40	3.10
Bar iron (3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.25c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb. Chicago, 3/32, 8.85c.; ⅛, 7¼c.; ¼, 7.95c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.00
Tin, 5-ton lots, New York			56.12½
Lead (up to carlots) E. St. Louis	8.15	New York	9.12½
Zinc (up to carlots) E. St. Louis	6.97½	New York	7.87½

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	18.00	19.00	....
Copper sheets, base	21.75	21.75	22.00
Copper wire, base	19.25	16.00	20.00
Copper bars, base	20.87½	20.75	22.50
Copper tubing, base	23.75	24.75	24.00
Brass sheets, base	18.12½	18.62½	18.37½
Brass tubing, base	22.75	25.25	26.00
Brass rods, base	15.87½	16.37½	18.37½
Brass wire, base	18.62½	20.12½	20.00

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1–15 ton lots	28.00	28.00	27.00
Zinc sheets (casks)	11.00	11.25	11.37
Solder (½ and ½), (case lots)	39.50	36.50	.....
Babbitt metal (83% tin)	60.00	65.00	50.00
Babbitt metal (35% tin)	28.00	20.50	28.00
Nickel (ingots) f.o.b. refinery	31.00	.....	.....
Nickel (electrolytic) f.o.b. refinery	38.00	.....	.....
Nickel (shot) f.o.b. refinery	32.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00
Manganese nickel hot rolled rods "E"—low manganese (base)	54.00
Manganese nickel hot rolled rods "D"—high manganese (base)	57.00

Base price of Monel Metal in cents per lb., f.o.b. Huntington W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00
Cold rolled sheets (base)			50.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.00@11.50	11.25	11.25
Copper, heavy, and wire	10.75@11.00	11.00	10.75
Copper, light, and bottoms	9.25@9.75	9.00	9.25
Heavy lead	6.00@6.25	6.25	6.25
Tea lead	5.00@5.25	3.75	4.50
Brass, heavy, yellow	6.75@7.25	6.50	6.75
Brass, heavy, red	8.50@8.75	8.75	8.75
Brass, light	5.75@6.00	5.50	5.75
No. 1 yellow rod turnings	7.25@7.50	7.00	7.25
Zinc	4.00@4.25	3.50	3.75

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$11.25	$11.45	$11.00
"A" Grade:				
IC,	14x20	8.85	9.40	8.50
	Coke Plates—Primes.			
100-lb.,	14x20	6.50	6.10	6.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	7.25	6.95	6.75

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.15@0.22	$0.19	$0.14
Cotton waste, colored, per lb.	.10@.15½	.18	.09½
Wiping cloths, 13¼x13¼, per lb	.17½	36.00 per M	.11*
Wiping cloths, 13¼x20½, per lb.	....	45.00 per M	.11*
Sal soda, per 100 lb. keg	2.25	2.25	2.00
Roll sulphur, per 100 lb. keg	3.60	3.75	2.85
Linseed oil, per gal., 5 bbl. lots	1.11	1.20	1.23
Lard cutting oil, 25% lard, per gal.	.55	.50	.32
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.35	.35	.21
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5%	20–5%	20–5%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50–5%	50–10%	60%
Second grade	50–10–5%	60–5%	65%

*White, at washery.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0349
Cold finished shafting	per lb.	.0415	.0415	.044
Brass rods	per lb	.1587½	.1587½	.145
Solder (½ and ½)	per lb.	.395	.395	.335
Cotton waste	per lb.	.15@.22	.15@.22	14@21
Washers, cast iron (½ in.)	per 100 lb.	7.00	7.00	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.38
Lard cutting oil	per gal.	.55	.55	.55
Machine oil	per gal.	.35	.35	.29
Belting, leather, medium	off list	30–10%	30–10%	40–2½%
Machine bolts up to 1x30 in.	off list	40%	40%	50%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$4.86	$5.84	$5.00
Emery paper	10.71	11.00	11.00
Emery cloth	28.00	31.12	32.75
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.50
Cloth	3.38	2.67	3.55
Fire clay, per 100 lb. bag		.65	.75
Coke, prompt furnace, Connellsville	per net ton		3.00@3.25
Coke, prompt foundry, Connellsville	per net ton		3.75@4.25
White lead, dry or in oil	100 lb. kegs	New York, 15.75	
Red lead, dry	100 lb. kegs	New York, 15.75	
Red lead, in oil	100 lb. kegs	New York, 17.25	

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1½ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%. Machine bolts, up to 1x30-in., with cold punched and hot-pressed hex. nuts, also button head bolts with hex. nuts are $3.50 per 100 lb at Cleveland.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x½-in., $1.00 per 100. List plus 35% at New York warehouses; with hex. heads, $4.65 per 100 lb. net at Chicago.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ¼x½-in., 2c. each. Discount 70% for $\frac{3}{16}$-in. and smaller and 65% for ¼-in. and larger.
Case hardened ¼x½-in., 6c. each, less 50%.

Rivets, button heads, ¾-in., ⅝-in., 1-in. diam. x2$\frac{1}{16}$-in. to 4½-in., $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1½ to 2-in. long, all diameters, 25c.; ⅝-in. dia., 35c.; ½-in. dia., 75c.; 1-in. long and shorter, 75c., longer than 5-in., 50c.; less than 200 lb., 50c.; countersunk heads, 45c.

Washers, cast iron, ⅜-in., $7.00* per 100 lb. at New York warehouses; ⅝-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Ill., Chicago—Yellow Taxi Cab Co., Inc., A. Bradfield, Vice-Pres., 57 East 21st St. garage and repair equipment for 100 car garage at Halifax, N. S.

Mass., Boston—Brown & Shapiro, Old South Bldg.—miscellaneous tools and equipment for repair and service garage on Northampton St.

Mass., Boston—Schoolhouse Dept., T. P. Glynn, Chrn., City Hall — metal working machinery for Emily Fifield School at Dunbar Ave., Dorchester.

Mass., Cambridge (Boston P. O.)—Letzelter Bros., 2511 Massachusetts Ave.—repair tools and equipment for service garage.

Mass., Dorchester (Boston P. O.) — Granite Ave. Garage Inc., 17 Granite Ave. additional equipment and repair tools for extensive garage.

Mass., Everett (Boston P. O.)—New England Tank & Tower Co., 44 Main St.—additional equipment for machine shop.

Mass., Malden (Boston P. O.)—Malden Machine Tool Co., 20 Exchange St.—No. 2 Knight milling machine.

Mass., Milton (Boston P. O.)—School Committee—manual training equipment including woodworking machinery.

Mass., South Boston (Boston P. O.) — C. Kraus, 2-4 Douglas St.—miscellaneous tools and equipment for repair garage.

Mich., Detroit—Hudson Motor Car Co., 12601 East Jefferson Ave.—equipment for die shop for automobile parts.

Mo., St. Louis—A. Leon, 5457 Vernon Ave.—tinners' tools, including brake, folder, squaring shear, etc.

N. Y., Buffalo—C. Sparling, 58 Congress St.—equipment for stove manufacturing plant.

N. Y., Buffalo—Loblaw Groceterias, Inc., 19 Doat St.—mortising machine.

O., Youngstown—Youngstown Sheet & Tube Co., sheet bar shear complete with piler, table and gauge for Indiana Harbor plant.

Ont., Collingwood—J. A. Currie—equipment for manufacture of heavy castings and wire rods for making nails and fencing.

Que., Montreal—L. Lirrete, 650 Des Gardins Ave.—equipment for machine and blacksmith shop.

Que., Montreal—Motorist Garage Ltd., Notre Dame St. East—lathe and tools for garage.

Que., Montreal East—Garage St. Jean, Notre Dame St.—miscellaneous tools and equipment for repair and service garage.

Que., Thetford Mines—J. Duquet, 121 Rue St. Alphonse—repair equipment for garage and machine shop.

Que., Wrightville (Hull P. O.)—D. B. Harper—complete machinery and equipment for planing mill.

Opportunities for Future Business

Ark., Little Rock—Capital City Casket Co., 604 East Markham St., awarded contract for a 3-story, 75 x 160 ft. factory building at Garland and Pulaski Sts. Estimated cost $45,000.

Calif., Hayward—Nelson Bros., 820 Castro St., plans the construction of a planing mill on Castro St. Estimated cost $10,000.

Calif., Los Angeles—Bd. of Education will receive until June 17th for the construction of a high school including shops, etc., on Mount Vernon Jr. High School site. Estimated cost $345,000. J. C. Austin and F. M. Ashley, Chamber of Commerce Bldg., Archts.

Calif., Ls Angeles—City has had plans prepared for the construction of Borroughs high school, including a shop building. Estimated cost $150,000. F. J. Catton, 2614½ West 7th St., Archt.

Conn., Bristol—The Horton Mfg. Co., North Main St., awarded contract for the construction of a 2 story plant for the manufacture of fishing tackle. Estimated cost $20,000.

Conn., New Britain—The New Britain Tool Co., Harvard St., awarded contract for the construction of a 22 x 30 ft. addition to factory.

Conn., Wallingford—International Silver Co., East Center St., awarded contract for the construction of factory including machine shop, etc., at East Center St. Estimated cost $100,000.

D. C., Washington—National Radiator Co., 1228 H St. N. W., awarded contract for the construction of a 72 x 225 ft. factory. Estimated cost $75,000.

Ill., Peoria—J. P. Goebel, 3001 Western Ave., awarded contract for the construction of a 100 x 135 ft. garage on Western Ave. $40,000.

Ia., Newton—Maytag & Co., awarded contract for the construction of a 2 story, 100 x 290 ft. washing machine factory. Estimated cost $141,000.

Your machine-tool wants inserted here free of charge

Address
BUSINESS NEWS DEPARTMENT
McGRAW-HILL CO., INC.,
10th Ave. at 36th St., New York.

Md., Baltimore — The Baltimore Copper Smelting & Rolling Co., Canton St., awarded contract for the construction of a new rod and wire plant. Estimated cost $1,000,000.

Md., Baltimore — The Flynn & Emrich Co., 305 North Holliday St., has had plans prepared for the construction of a 90 x 360 ft. plant including foundry, machine shop, storage building, etc., at Exeter Hall Ave. and Taylor St. Estimated cost $52,000.

Md., Baltimore — Montgomery Ward & Co. plans the construction of a fabricating plant for the manufacture of fence wire. The first unit will contain 10,000 sq.ft.

Mass., Boston—Boston Elevated Ry., Park Sq. Bldg., awarded contract for the construction of a 90 x 300 ft. car, storage and repair shop. Estimated cost $100,000.

Mass., Dorchester (Boston P. O.)—Dept. of Public Works, J. A. Rouke, Comr., Boston, plans the construction of a repair and service garage on Hancock St. here. Estimated cost $50,000. Architect not selected.

Mass., Dorchester (Boston P. O.)—W. W. Drummey, 60 Boylston St., Boston, Archt., plans the construction of a 65 x 200 ft. machine, forge, garage and storage shop on Clayton St., here. Estimated cost $60,000. Owner's name withheld.

Mass., Everett (Boston P. O.)—New England Tank & Tower Co., 44 Main St., awarded contract for the construction of a 50 x 215 ft. machine shop on Tileson St. Estimated cost $40,000. Noted June 4.

Mass., Framingham — Manufacturing Equipment & Engineering Co. is having plans prepared for the construction of a 60 x 200 ft. factory addition and 50 x 70 ft. japan building. Estimated cost $50,000. Monks & Johnson, 99 Chauncy St., Boston, Archts.

Mass., Revere (Boston P. O.)—S. Dickman, 1618 North Shore Road, awarded contract for the construction of a 75 x 90 ft. repair and service garage on Shirley St. Estimated cost $40,000.

Mass., Lynn—Central Motors Co., 20 Mt. Vernon St., awarded contract for the construction of a 2 story, 50 x 60 ft. repair shop. Estimated cost $60,000.

Mass., Lynn—City, R. F. Hand, City Hall, awarded general contract for a 2 story, 50 x 142 ft. shop, garage and storage building on Bennett St. $67,400. Noted May 28.

Mich., Dearborn—Ford Motor Co., Highland Park, plans the construction of a 201 x 318 ft. shop and laboratory extension including garage, blacksmith shop, electrotype, electroplate, and nickelplate departments, etc. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Mich., Detroit—A. Kahn, 1000 Marquette Bldg., Archt., will take bids about June 20th for the construction of a 63 x 480 ft. shop on Connors Ave. for Hudson Motor Car Co., 12601 East Jefferson Ave.

Mich., Detroit—The Rich Steel Products Co., 1338 Clay St., awarded contract for the construction of first 2 or 3 building additions to present plant. Estimated cost $400,000.

Mich., River Rough — Ford Motor Co., Highland Park, awarded contract for the construction of a 400 x 1,060 ft. open hearth plant, here.

Minn., South St. Paul—Chicago, Milwaukee & St. Paul Ry., 80 East Jackson Blvd., Chicago, Ill., awarded contract for the construction of a roundhouse and machine shop here. Estimated cost $1,000,000.

N. Y., New York—Armory Bd., Municipal Bldg., awarded contract for the construction of a machine shop and school at 125 West 14th St. for 9th Coast Defense.

N. Y., New York—Treasury Dept., Washington, D. C., will receive bids until July 1st for the construction of a carpenter and machine shop for United States Barge Office here. J. A. Wetmore, Acting Supervising Archt.

O., Cincinnati—National Radiator Co., 827 Un. Cent. Bldg awarded contract for the construction of a 60 x 180 ft. factory. Estimated cost $60,000. Private plans.

O., Cleveland—K. V. Painter, 6523 Euclid Ave., awarded contract for the construction of a 2 story, 40 x 110 ft. factory addition at 1960 East 24th St. Estimated cost $45,000. Solenberger Piston Ring Co., 1966 East 66th St., is lessee.

O., Wooster—Toy Kraft Co., plans the construction of a 2 story, 60 x 120 ft. factory addition. Estimated cost $40,000.

Pa., Brownesville—Monongahela Railway Co., 1202 Century Bldg., Pittsburgh, awarded contract for the construction of a 250 x 250 ft. car and machine shop here. Estimated cost $100,000.

Pa., Grove City—Bessemer Gas Engine Co., plans the construction of two 1 story, 60 x 180 ft. plant additions. Private plans.

Pa., Philadelphia—Shortz & Co., Juniper and Walnut Sts., awarded contract for the construction of a 112 x 243 ft. garage at Yorkwood and Ruscomb Sts. Estimated cost $150,000.

Wis., Tomahawk—Raymond Lumber Co., M. M. Raymond, Mgr., plans the construction of a saw and planing mill to replace fire loss. Estimated cost $50,000. Architect not selected.

Ont., Windsor—Liberty Garage, G. Desrosiers, 523 Langlois Ave., plans the construction of a plant to replace fire loss. Estimated cost $50,000.